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**United States
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BULLETIN NO. 67

Report of the International Ice Patrol Service in the North Atlantic Ocean

Season of 1981

CG-188-36

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Bulletin No. 67

REPORT OF THE INTERNATIONAL ICE PATROL SERVICES IN THE NORTH ATLANTIC OCEAN

Season of 1981

CG-188-36

FOREWORD

Forwarded herewith is Bulletin No. 67 of the International Ice Patrol describing the Patrol's services, ice observations, and conditions during the 1981 season.

N. C. VENZKE
Chief, Office of Operations

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INTRODUCTION

This is the 67th in a series of annual reports on the International Ice Patrol Service in the North Atlantic. The U.S. Coast Guard conducted the 1981 International Ice Patrol service to observe the southeastern, southern, and southwestern limits of icebergs in the vicinity of the Grand Banks of Newfoundland to inform international mariners of the extent of the iceberg hazard.

Commander, International Ice Patrol, who reports to Commander, U.S. Coast Guard Atlantic Area, directed the 1981 operations from the International Ice Patrol Office located at Governor's Island, N.Y. Ice Patrol personnel analyzed aerial reconnaissance information and other ice and environmental data and prepared the daily ice bulletins and facsimile charts for radio transmission to the maritime community. All Coast Guard units deployed on Ice Patrol missions were under the operational control of Commander, International Ice Patrol.

Preseason flights in January, February, and March 1981 determined the early season iceberg distributions. Based on these flights, the 1981 reconnaissance season commenced on 13 March. From that date until 24 July 1981, an Ice Reconnaissance Detachment operated from St. John's, Newfoundland, averaging a patrol every two days over the Grand Banks. The reconnaissance season was officially closed 27 July 1981.

The historical current field used as the data base to predict the drift of the icebergs in the Grand Banks region was validated by tracking TIROS Oceanographic Drifters (See Appendix A).

During the 1981 season, only an estimated 63 icebergs drifted south of 48 degrees North. Monthly estimates of icebergs which crossed that latitude are shown in Table 1.

TABLE 1
ESTIMATED ICEBERGS DRIFTING SOUTH OF 48 DEGREES NORTH

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	TOTAL
1981	0	0	0	0	0	0	48	10	5	0	0	0	63
AVERAGE 1946-1981	0	0	0	0	2	8	33	88	85	51	14	3	284
AVERAGE 1900-1981	3	1	1	1	2	9	40	98	124	65	21	6	372

DATA COLLECTION AND DISSEMINATION

During the 1981 Ice Patrol Season (1 September 1980–31 August 1981) 129 aircraft sorties were flown in support of the International Ice Patrol. These included preseason surveys, ice observation flights, and logistics flights. Preseason flights determined iceberg concentrations north of 48 degrees latitude. These were necessary to estimate the time when icebergs would threaten the North Atlantic shipping lanes in the vicinity of the Grand Banks. During the active season, ice observation flights mapped the southwestern, southern, and southeastern limits of icebergs. Logistic flights were necessary for aircraft maintenance. Table 2 shows aircraft utilization during the 1981 season.

U.S. Coast Guard C–130 aircraft, deployed from either Coast Guard Air Station Elizabeth City, North Carolina, or Coast Guard Air Station Clearwater, Florida, conducted aerial ice reconnaissance. These aircraft operated from St. John's Newfoundland.

As in the past, the Ice Patrol Office requested all ships to report ice sightings, weather, and sea surface temperatures to U.S. Coast Guard communications stations. Response to this request was good, as shown in Table 3. Appendix B lists all of the contributors. The ten most frequent contributors of this information were:

USCGC	EVERGREEN	(US)	NRXD
M/V	KANSAS GETTY	(LI)	DSOP
M/V	KARA	(FI)	OIVD
M/V	MIHO PRACAT	(YO)	YTAU
M/V	MIROSLAWIEC	(PL)	SQFH
M/V	STRAIT OF CANSO	(UK)	GUWU
M/V	M.T. NARIAN SEA	(UK)	GYOK
M/V	DASHAKI	(LI)	ELAL5
M/V	ORIENT HARMONY	(SW)	SLBC
M/V	OCEAN BIKO	(JA)	JKDC

U.S. Coast Guard Communications Station NMF/NIK Boston, MA was the primary radio station used for the dissemination of the daily ice bulletin and facsimile chart. The Ice Patrol Office in New York prepared the bulletin and chart and sent it to numerous radio stations for broadcast to mariners.

TABLE 2

AERIAL ICE RECONNAISSANCE (1 SEP 1980-31 AUG 1981)

ICERECON FLIGHTS	NUMBER OF FLIGHTS	NUMBER OF HOURS
PRESEASON	26*	95.3
IN SEASON	96	427.7
LOGISTICS	7	33.0
TOTALS	129	556.0

NOTE: In season flights include transport of personnel to and from St. John's for normal crew rotation.

* Not all flights were ice survey flights

TABLE 3

NUMBER OF SHIPS REPORTING SEA SURFACE TEMPERATURES (SST)	37
NUMBER OF SST REPORTS RECEIVED	302
NUMBER OF SHIPS FURNISHING ICE REPORTS	22
NUMBER OF ICE REPORTS RECEIVED	39
FIRST ICE BULLETIN	13 0000Z MAR 81
LAST ICE BULLETIN	28 0000Z JUL 81
NUMBER OF FACSIMILE CHARTS TRANSMITTED	138

MONTHLY ICE AND ENVIRONMENTAL CONDITIONS

September-October 1980

Ice Patrol received no iceberg sighting reports during these months. No sea ice was reported south of 62°00N. Figures (1a) and (1b) depict the sea surface atmospheric pressure averages for these months, showing near normal conditions.

September brought three extratropical cyclones across the North Atlantic between 45°00N and 55°00N. Mild conditions prevailed during the first two weeks but gave way to record cold and abundant rains for the rest of the month. The predominant windflow for the month of September over the Grand Banks region was out of the southwest.

October weather was near normal. There were only two major storms during the month. One storm occurred during the first week and the other storm during the last week of the month. The predominant windflow over the Grand Banks region for the month of October was out of the west-southwest.

November 1980

Ice patrol received no iceberg sighting reports during this month. Sea ice started accumulating and was reported as far south as 61°30N (Figure 2a) with 8–10 tenths of new and young ice.

The major sea level pressure feature was the displaced 1002mb Icelandic Low. It was centered around 47°00N, 42°00W about 1000 miles west of its usual position (Figure 1c). Extratropical storm passages during November came late in the month. There was a cluster of storm paths over Canada north of 55°00N which remained over the area. Temperatures were near normal; rain and snowfall were above normal in most areas. The predominant windflow over the Grand Banks area was out of the southwest.

December 1980

Ice Patrol received no iceberg sighting reports during this month. Sea ice development continued its southerly trend with 7–9 tenths of strips and new ice reported along the coast of Newfoundland as far south as 49°00N. There was fast ice, reported as 10 tenths new and young ice, along the coast of Labrador as far south as 51°45N and extending approximately 60 miles off the coast (Figure 2b).

The average sea level pressure pattern for December varied considerably from the mean values for the period 1948 to 1970 (Figure 1d). The Icelandic Low had two centers of depression. There was an upper air low over Baffin Island, matching the one shown in this area's normal pressure pattern, but the lowest height center was over Nordkapp which differs from the climatic average. The upper air high was northeast of its usual position and more intense. A trough paralleled the east coast. St. John's Newfoundland recorded 11.8 degrees Celsius on the 25th, the warmest Christmas Day ever recorded. Precipitation totals were generally above normal for most areas. The predominant windflow for the month was from the southwest over the Grand Banks region.

January 1981

Ice Patrol received no iceberg sighting reports for below 50°00N during this month. The first preseason survey flight departed New York on 26 January. Reported sea ice conditions were open water from Cape Bauld south to Cape Freels with no ice south of this point. In late January (Figure 2c) 8–10 tenths concentrations of nilas were reported 30 miles east of Notre Dame Bay and extended north of 52°00N. The sea ice limit for the month extended as far south as 48°00N.

The Icelandic Low was about 500 miles further west than normal (Figure 1e). On the 5th there was a low pressure system over the Labrador Sea. A deepening frontal wave was travelling over Newfoundland and absorbed the circulation late in the day. It brought strong gales to the Grand Banks with winds in excess of 45 knots and seas in excess of 20 feet. During the first 23 days the Maritimes were hit by 5 major snow storms. Snowfall totals were well above normal over the entire province of Newfoundland and Labrador. Temperatures were

less severe in Newfoundland and colder than normal in Labrador. The predominant windflow over the Grand Banks region for the month was out of the southwest.

February 1981

Preseason flights were made on 7 and 19–21 February. Many icebergs were reported but none were south of 50°00N. Sea ice limits for February extended as far south as 48°40N and as far east as 48°30W. New and young ice in concentrations of 7–9 tenths was reported as far south as Cape Bonavista (Figure 2d).

The Icelandic Low was 996mb near Keflavik, about 50 miles northeast of its normal 997mb position (Figure 1f). This displacement produced two major anomaly centers. The negative one of 10mb was located near Keflavik. A positive 15mb center was located east of Cape Race and was the larger of the two. The region experienced low snowfall totals with rainfall also below normal in scattered areas. Many low-lying areas, however, were struck by the worst floods in 52 years, and power failures were attributed to high gusting winds in excess of 100 kilometers per hour. The predominant windflow for the month over the Grand Banks region was out of the west-northwest.

March 1981

The last preseason survey flight was made in early March. The International Ice Patrol opened the season with the first bulletin transmitted on 0000Z 13 MAR 81. Regularly scheduled aerial reconnaissance flights commenced and a few icebergs were sighted below 48°00N with the southernmost one being at 45°50N. There were many bergs sighted north of 48°00N (Figures 3a and 3b). The sea ice limits (Figure 2e) extended as far south and east as 49°00N 48°00W. First year, new and young ice was reported in concentrations of 7–9 tenths off Cape Bauld and as far south and east as 51°00N 52°00W. There were also reports of belts and strips east of Conception Bay in 6–8 tenths concentrations. Southeast of St. John's there were reports of belts and strips in concentrations of 8–10 tenths. Sea ice diminished greatly throughout the month with the limit moving up to 50°30N 55°00W.

The Icelandic Low was centered about 500 miles further south than normal and was much deeper (Figure 1g). There were two late winter storms which interrupted a relatively uneventful month. Both storms had winds gusting to over 100 kilometers per hour with heavy snow and freezing rain. Even with the two late storms, snowfall was below average for the month except in Gander, Newfoundland where a new record high was set. Temperatures averaged 2–6 degrees above normal. The predominant windflow over the Grand Banks region was out of the northeast.

April 1981

Figures 3c and 3d are the iceberg conditions for 15 and 31 April, respectively, showing the reduction in berg number that developed during this month. The major constituents of sea ice (Figure 2f) were belts and strips northeast of Notre Dame Bay in concentrations of 5–8 tenths as well as 7–9 tenths of first year ice just off Cape Bauld. The ice limit originated from a point near Cape Freels north to 50°00N 53°00W where it extended north-northwest along the coast above 52°00N.

The Icelandic Low (Figure 1h) was near normal for the month. April was generally overcast and mild throughout the Maritimes. A warm spell for the first half of the month tied record high temperatures at several sites. Labrador, however, was cold and reported snowfall almost daily. The predominant windflow for the month over the Grand Banks region was out of the southwest.

May 1981

Ice Patrol flights sighted few icebergs this month with only one growler reported south of 48°00N (Figures 3e and 3f). The sea ice limit for May (Figure 2g) showed much deterioration and the southern limit extended only as far south as 51°50N and as far east as 51°30W. The ice accompanying the limit was 2–4 tenths concentrations of belts and strips in White Bay and 8–10 tenths of belts and strips in Notre Dame Bay.

The Icelandic Low deviated somewhat from the normal (Figure 1i) and it was a mild but wet month in the Atlantic Region. Apart from the southeast coast of Newfoundland, precipitation was well above normal. Two major storms produced more than 100mm of rain and caused flooding in the Cape Breton area where unofficial totals of over 150mm of rain were reported. Temperatures were 1–2 degrees C above normal except in Newfoundland where the temperature was as much as 3 degrees C above normal. The predominant windflow over the Grand Banks region was out of the northeast.

June 1981

There were a number of iceberg sightings reported this month. However, only one was reported south of 48°00N (Figures 3g and 3h). The deterioration of the ice limit continued, extending to just above 52°00N. Sea ice conditions are shown in Figure 2h.

The Icelandic Low deviated somewhat from its normal location; however, the pressures were near normal (Figure 1j). The month of June was cloudy and wet along the eastern coasts. Precipitation totals were well above normal due to numerous, heavy thunderstorms with one storm producing high winds and rains which resulted in the loss of three fishing vessels off the coast of Nova Scotia. Temperatures were above normal for most areas except Labrador where it was cooler than average. The predominant windflow over the Grand Banks region was out of the southwest.

July-August 1981

During the month of July there were no iceberg sightings reported below 48°00N (Figure 3i). No sea ice was reported south of 62°00N (Figure 2i). The last Ice Reconnaissance Detachment departed St. John's, Newfoundland on 24 July and the ice patrol season officially closed with the 0000Z 28 July transmission.

Several storms disrupted an otherwise sunny, seasonally mild 2 month period for the Maritimes. Mean temperatures were near normal in most areas. However, slightly cooler temperatures were recorded in Newfoundland and Labrador. Precipitation totals were above normal in Nova Scotia and Newfoundland, largely because of a heavy rainstorm on July 21st when more than 50mm of rain fell in 24 hours. Reports of flooding were numerous. Despite high rainfall, sunshine totals were high, with Prince Edward Island recording a high total of 279.3 hours for July. The predominant windflow for this period was out of the west-southwest. The average pressures shown in Figure (1k) indicate near normal conditions for July. Figure (1m) shows the average pressures for August.

SUMMARY

The 1981 International Ice Patrol season was relatively short with fewer than average icebergs drifting south of 48°N latitude. The ice sightings and sea surface temperature reports received were useful in the preparation of the daily ice bulletin and facsimile chart.

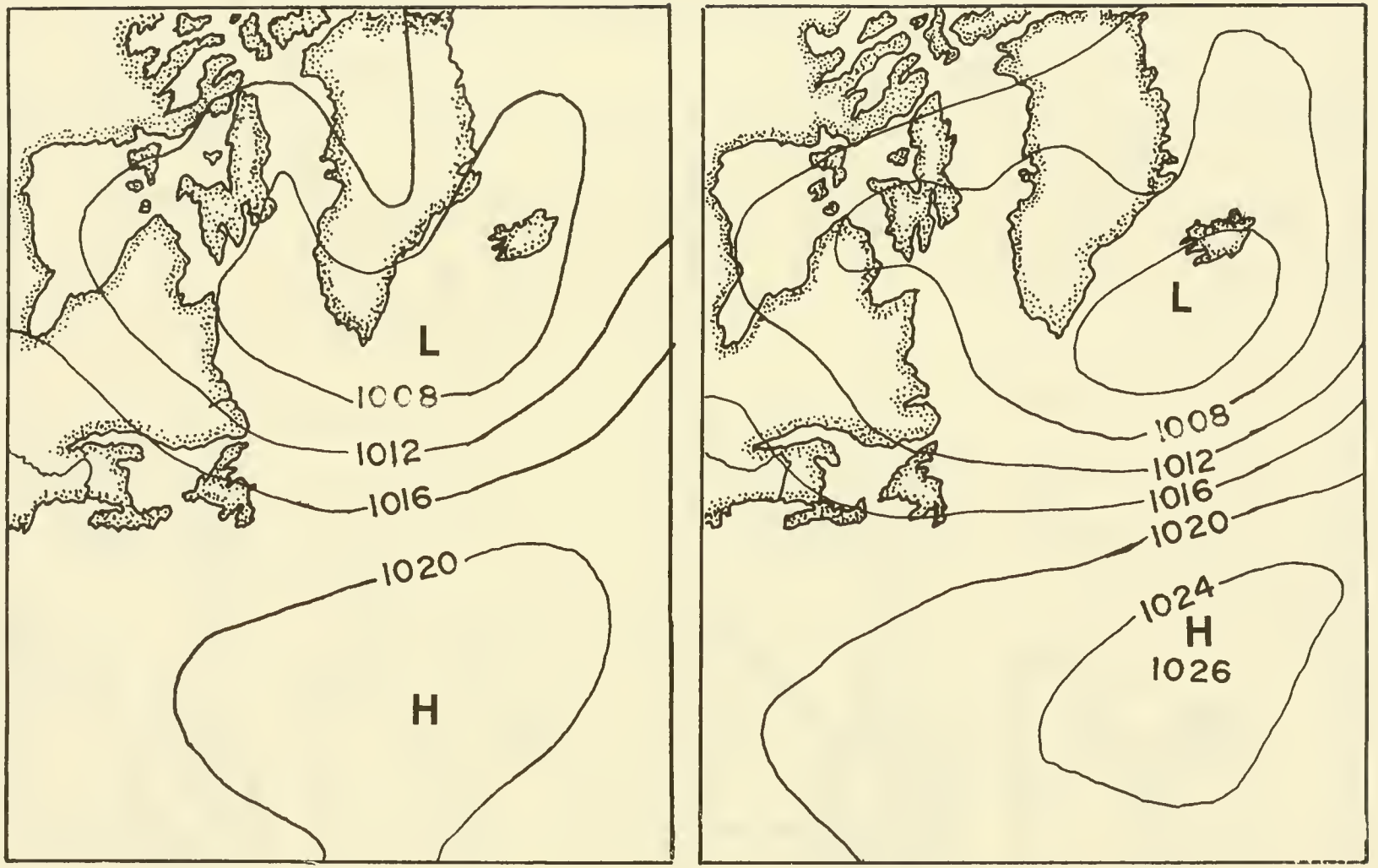
ACKNOWLEDGEMENTS

The U.S. Coast Guard conducted the 1981 International Ice Patrol Service in the North Atlantic Ocean under the provisions of Title 46, U.S. Code, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea (SOLAS), 1974, regulations 5 and 6.

The Marine Science Branch of Commander, U.S. Coast Guard Atlantic Area prepared this report and acknowledges the assistance and information provided by the Canadian Atmospheric Environment Service, U.S. National Weather Service, Navy Fleet Numerical Oceanographic Center, Navy Polar Ocean Center, U.S. Coast Guard Oceanographic Unit and the U.S. Coast Guard Research and Development Center.

We take this opportunity to extend our sincere appreciation to the staff of Canadian Coast Guard Radio Station St. John's Newfoundland/VON and the St. John's Weather Forecasting Office for their continued excellent support during the 1981 Ice Patrol season.

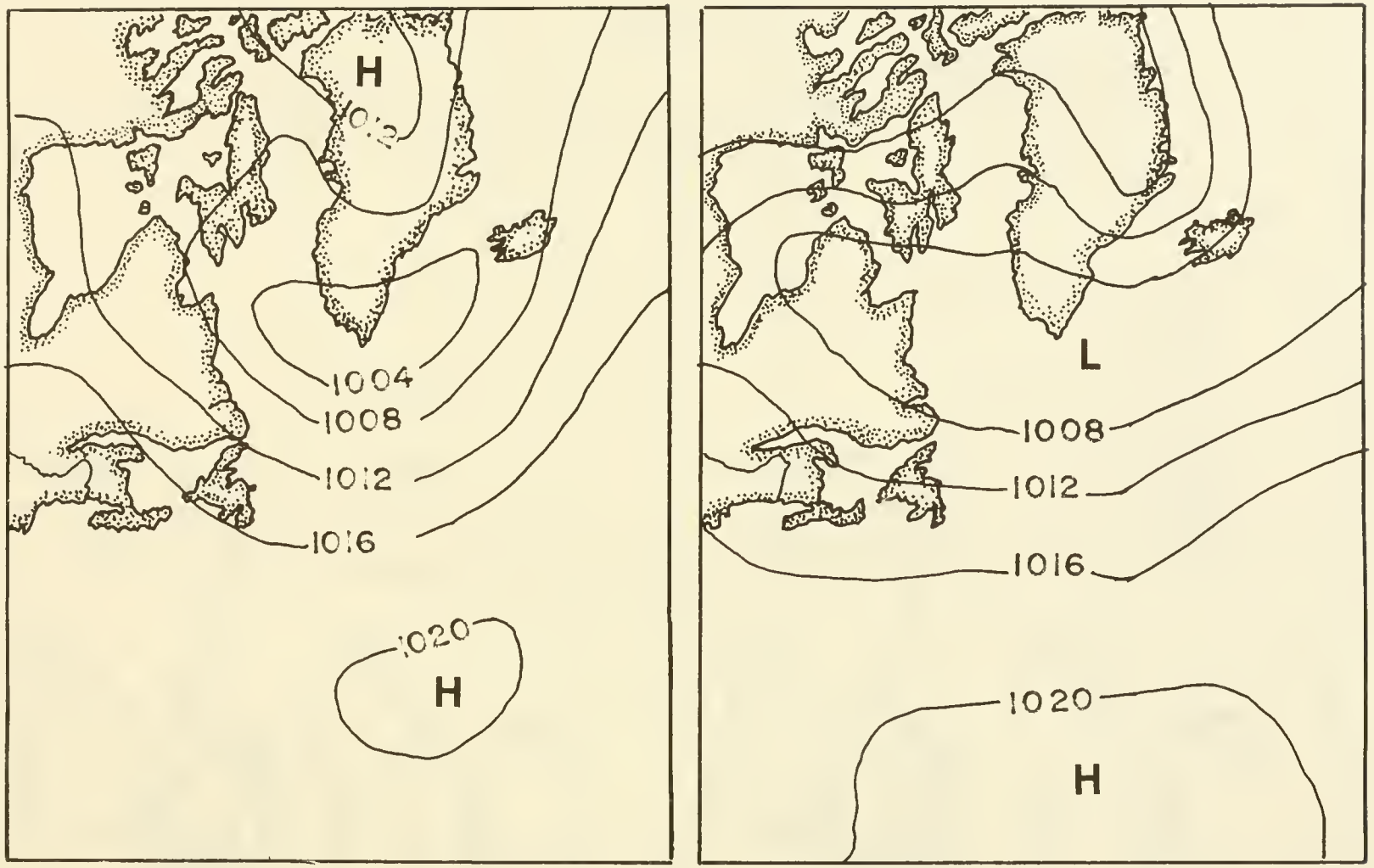
Figure 1—Monthly normal and observed surface atmospheric pressure. The normal atmospheric pressure for each month was determined by averaging the observed pressures from 1948 to 1970. Pressure is indicated in millibars.



Normal

September 1980

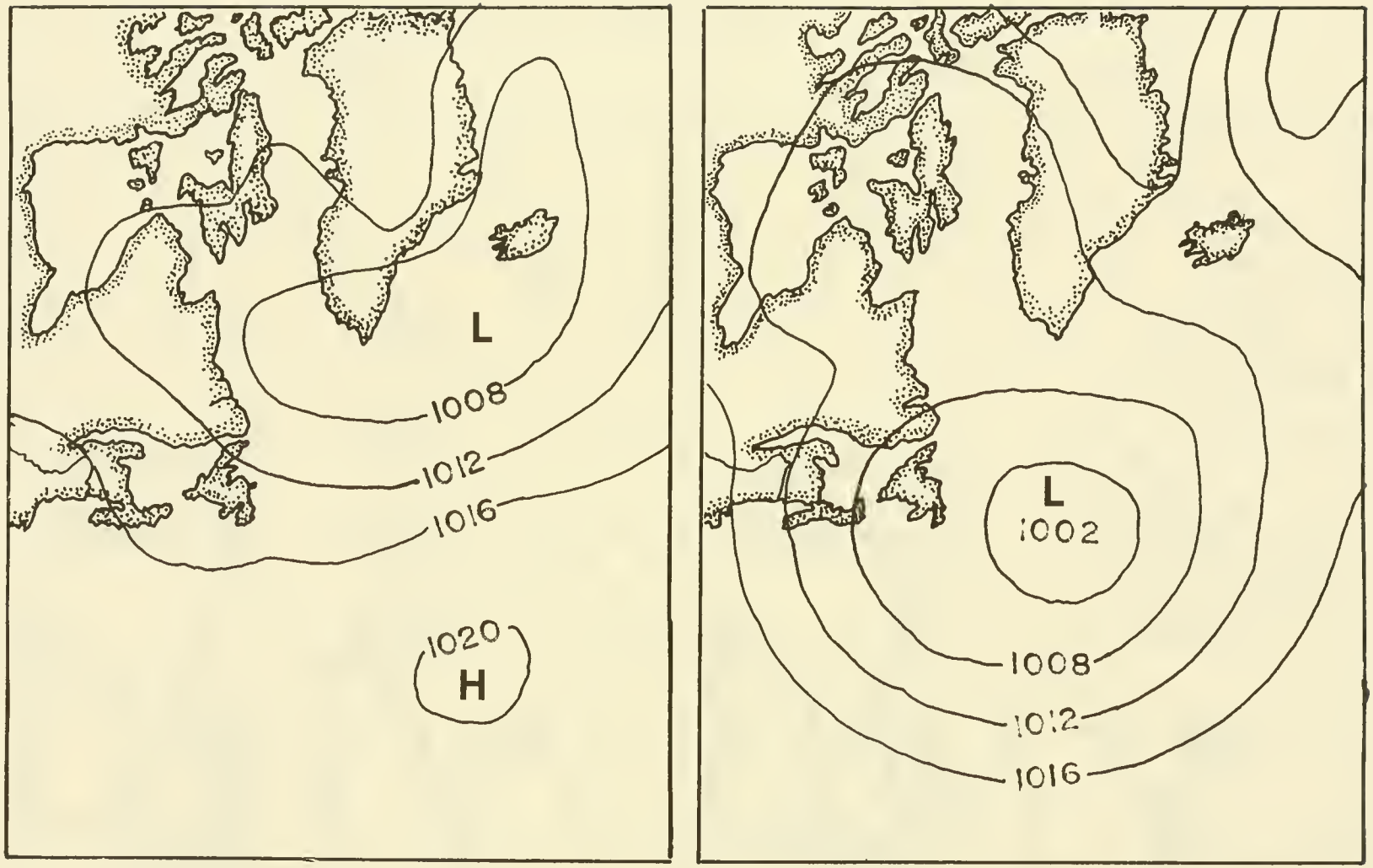
Figure 1a



Normal

Figure 1b

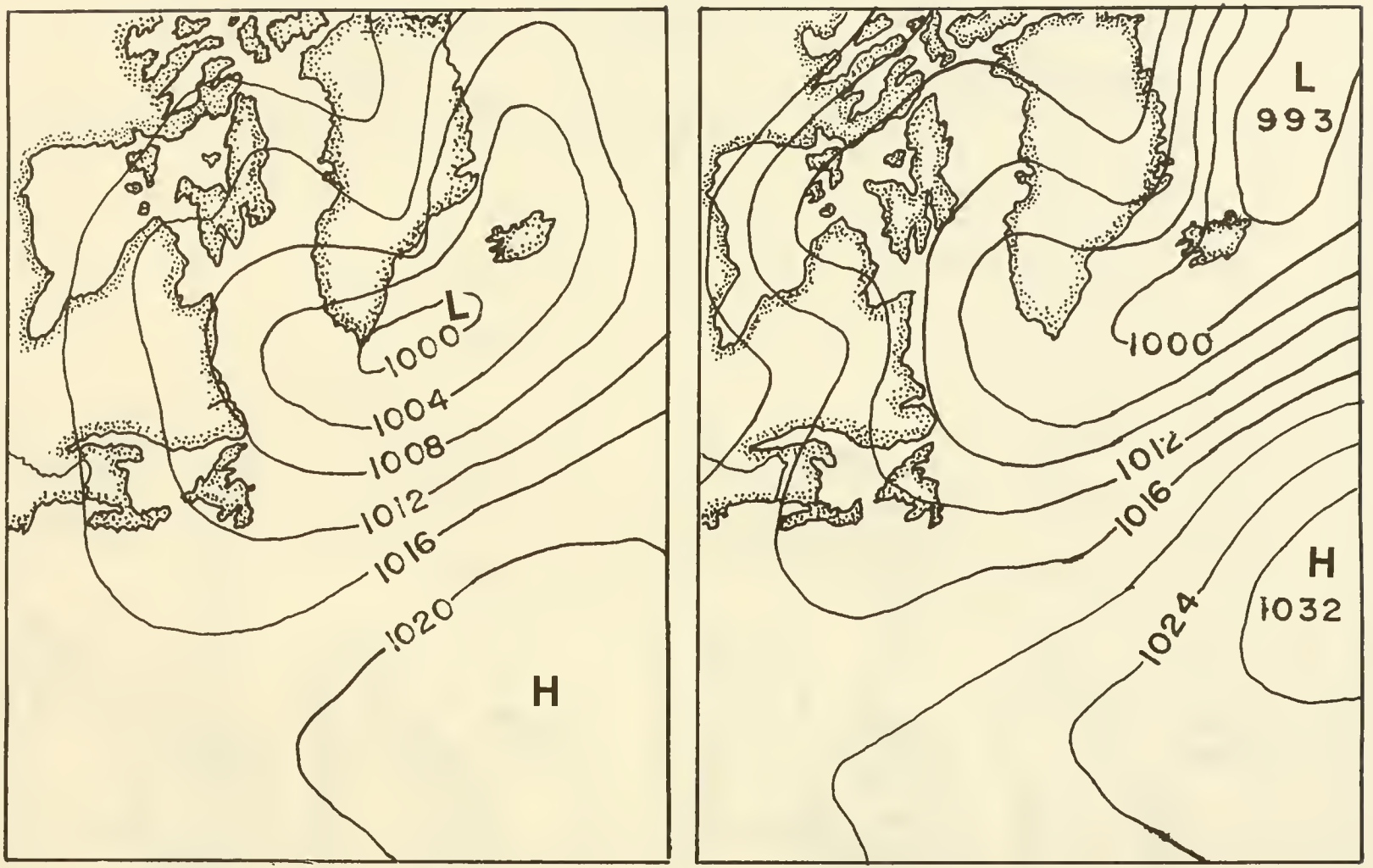
October 1980



Normal

November 1980

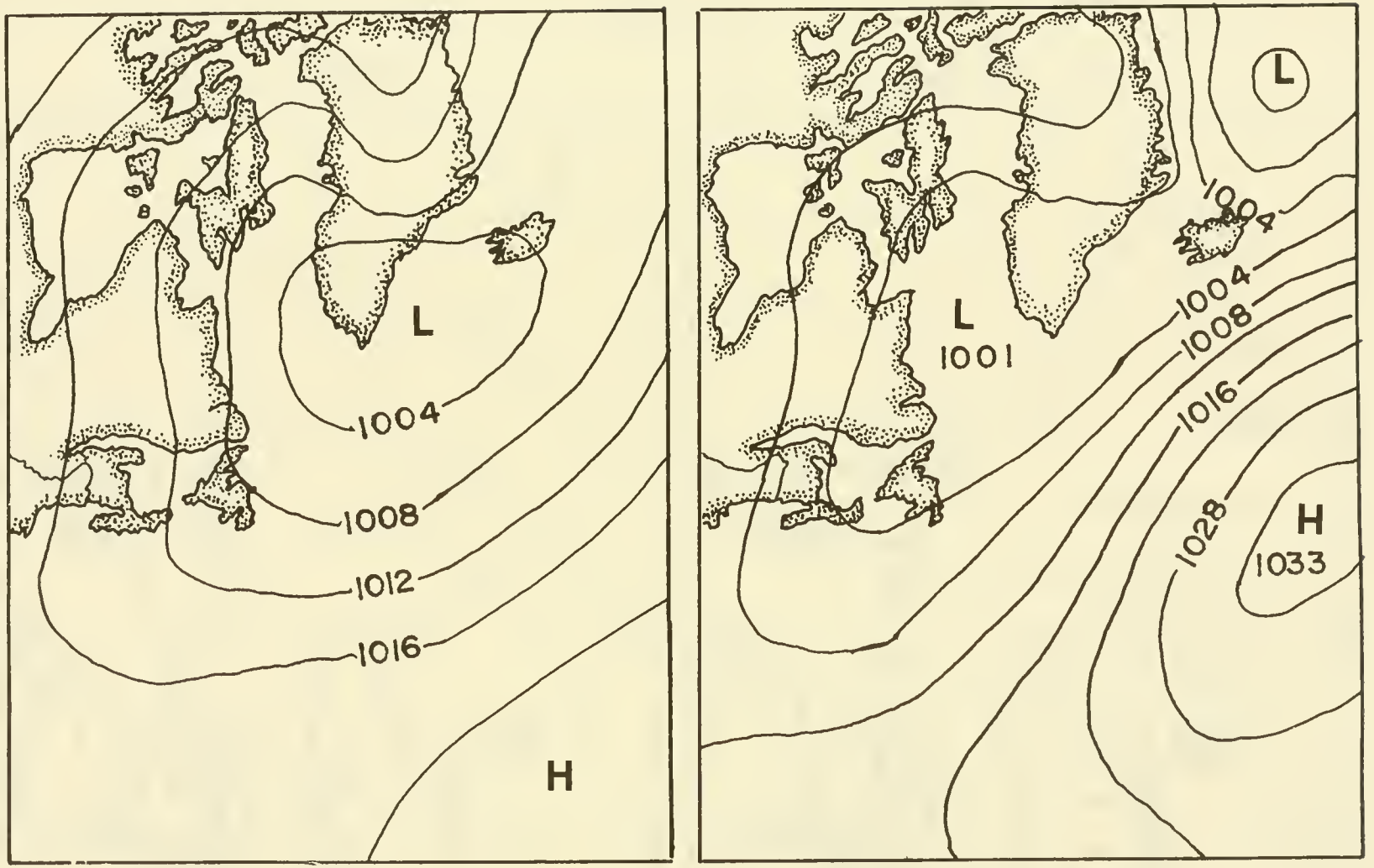
Figure 1c



Normal

December 1980

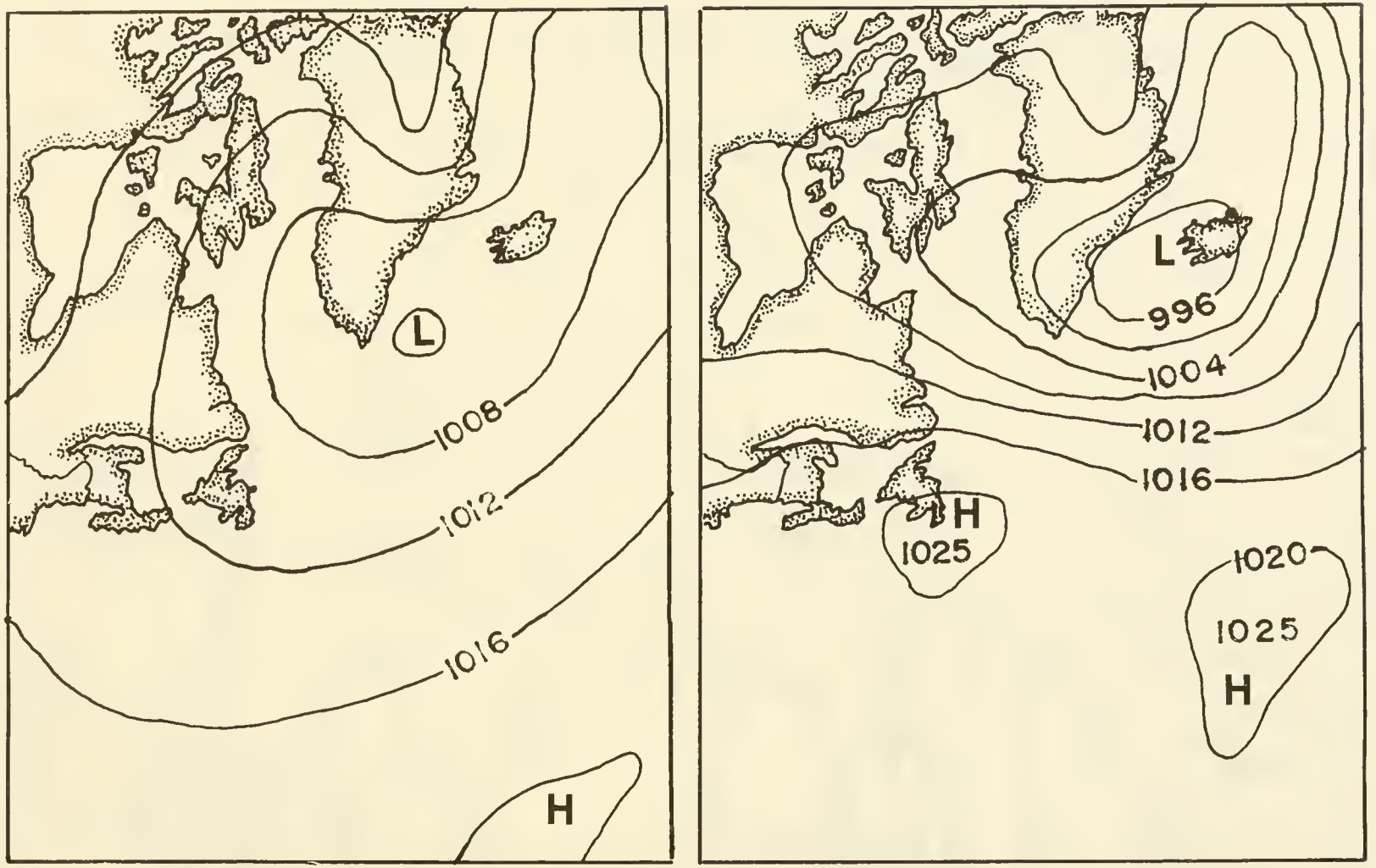
Figure 1d



Normal

January 1981

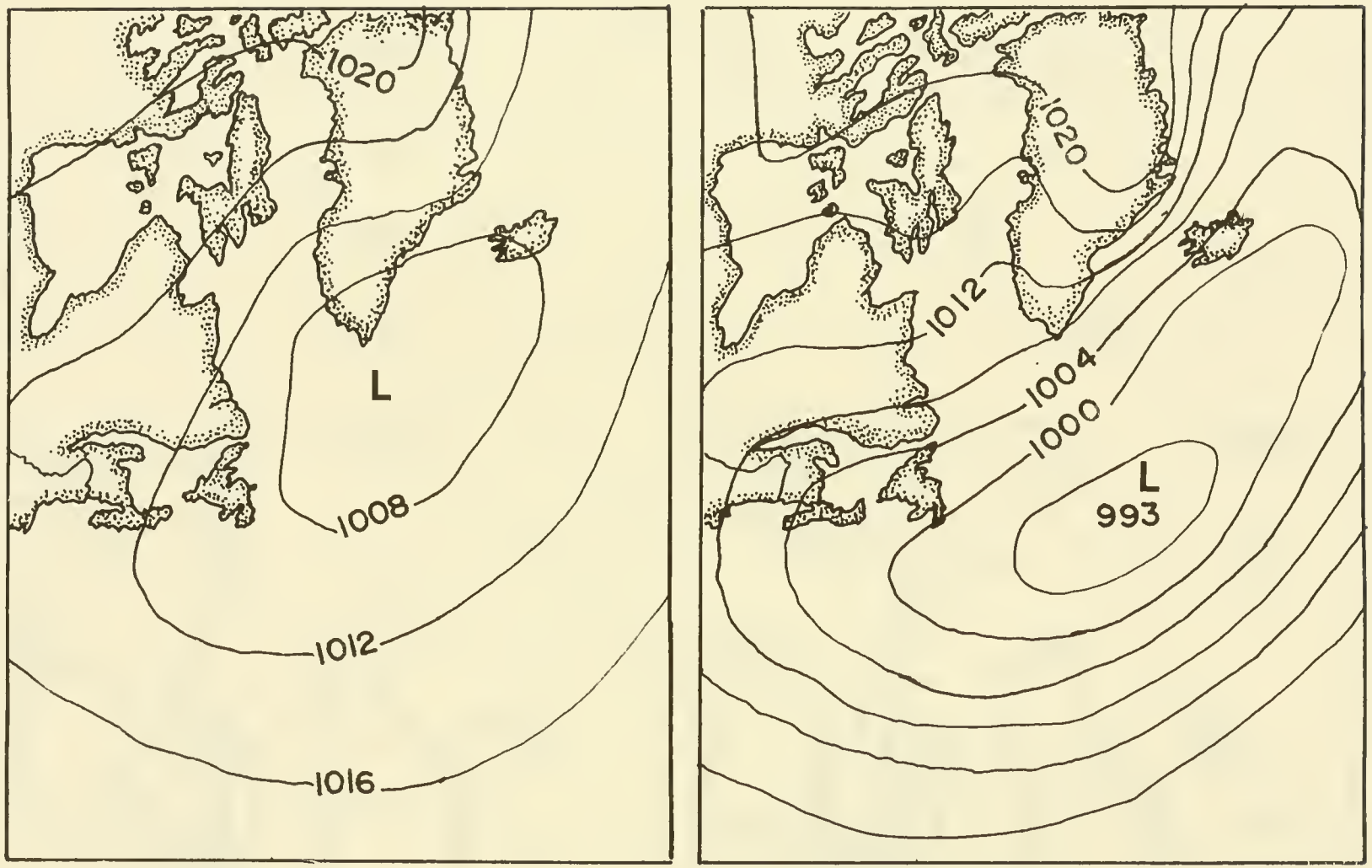
Figure 1e



Normal

February 1981

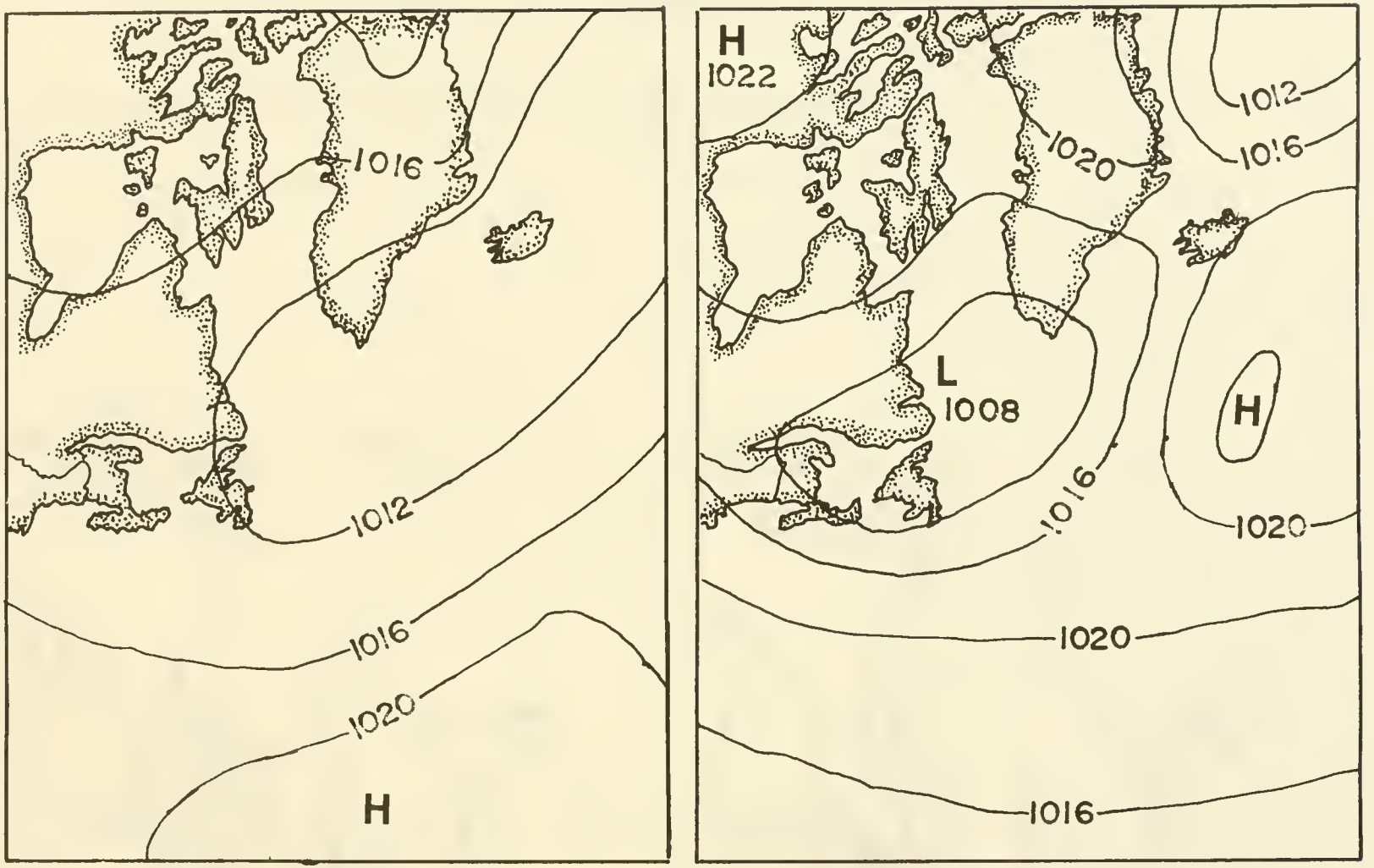
Figure 1f



Normal

March 1981

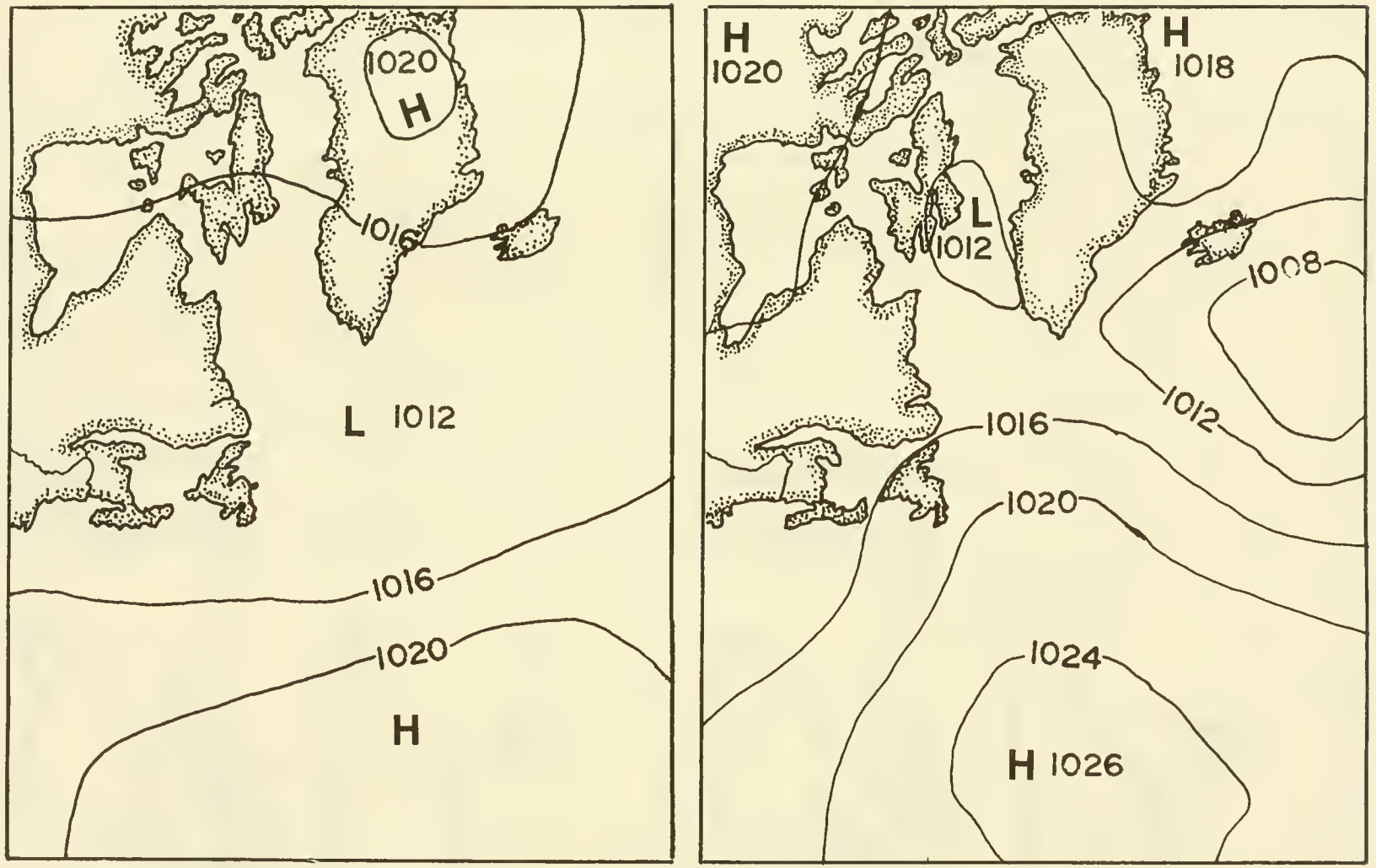
Figure 1g



Normal

April 1981

Figure 1h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1008
1012
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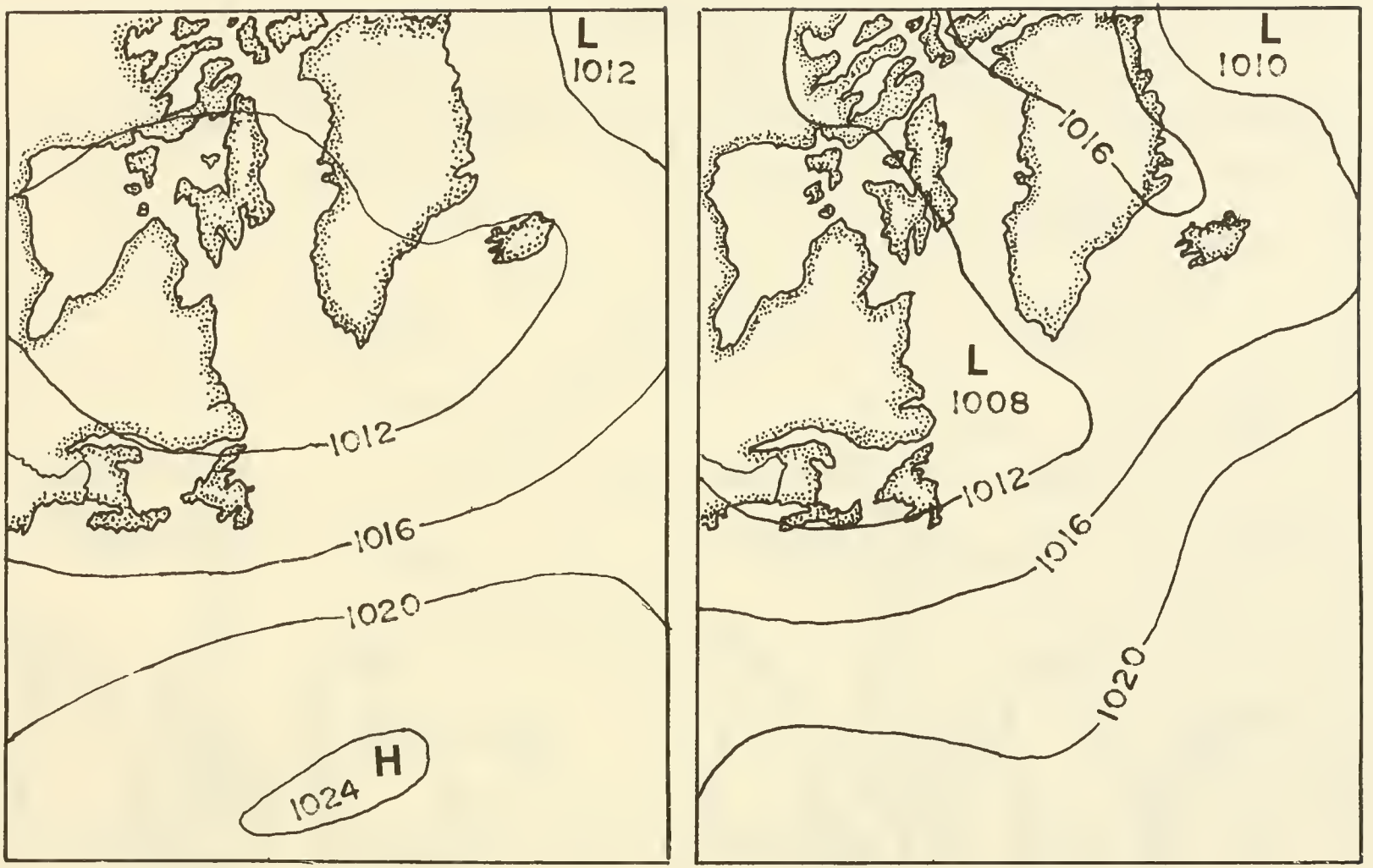
1020
1024
H 1026
May 1981

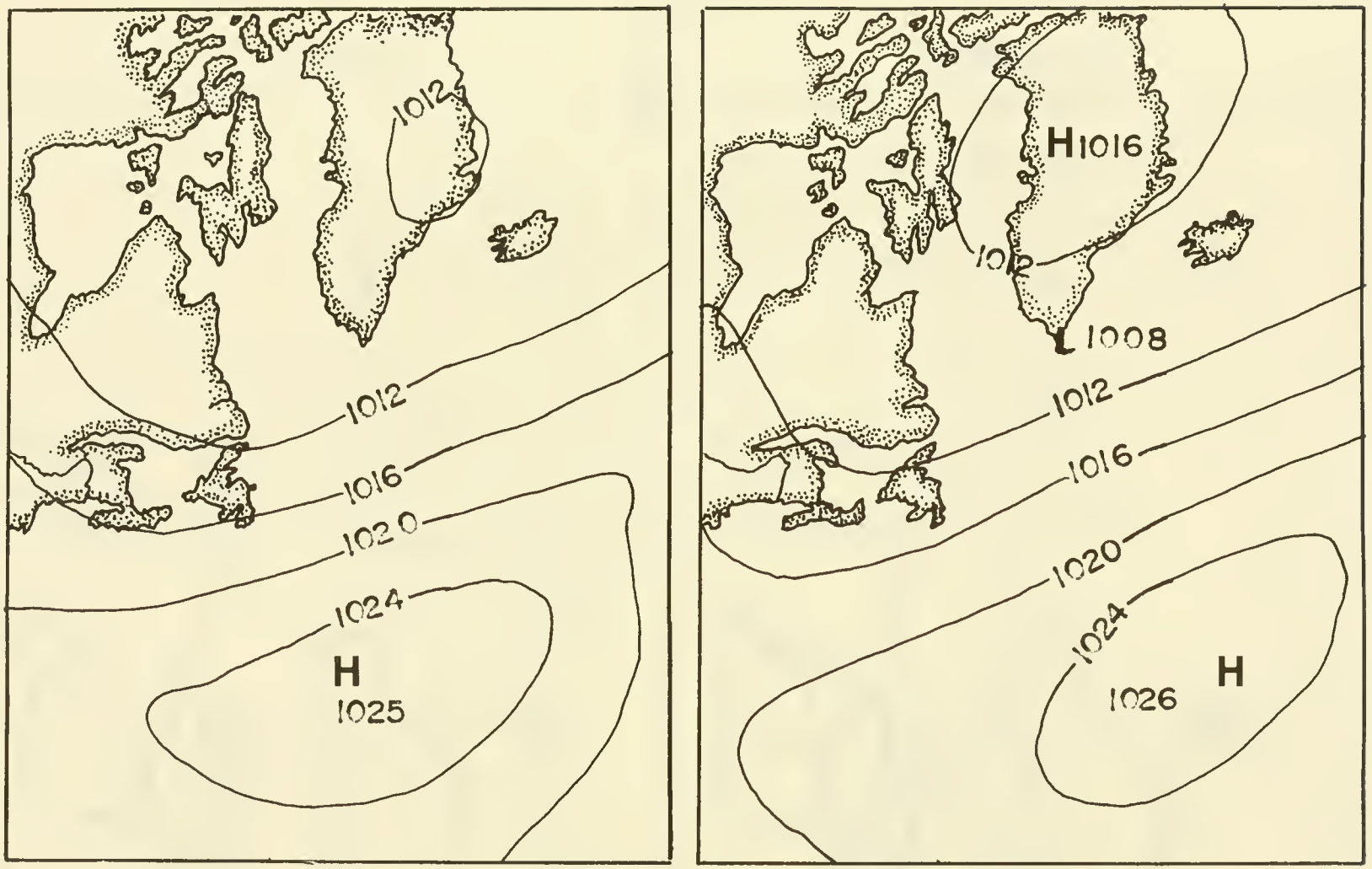
Figure 1i



Normal

June 1981

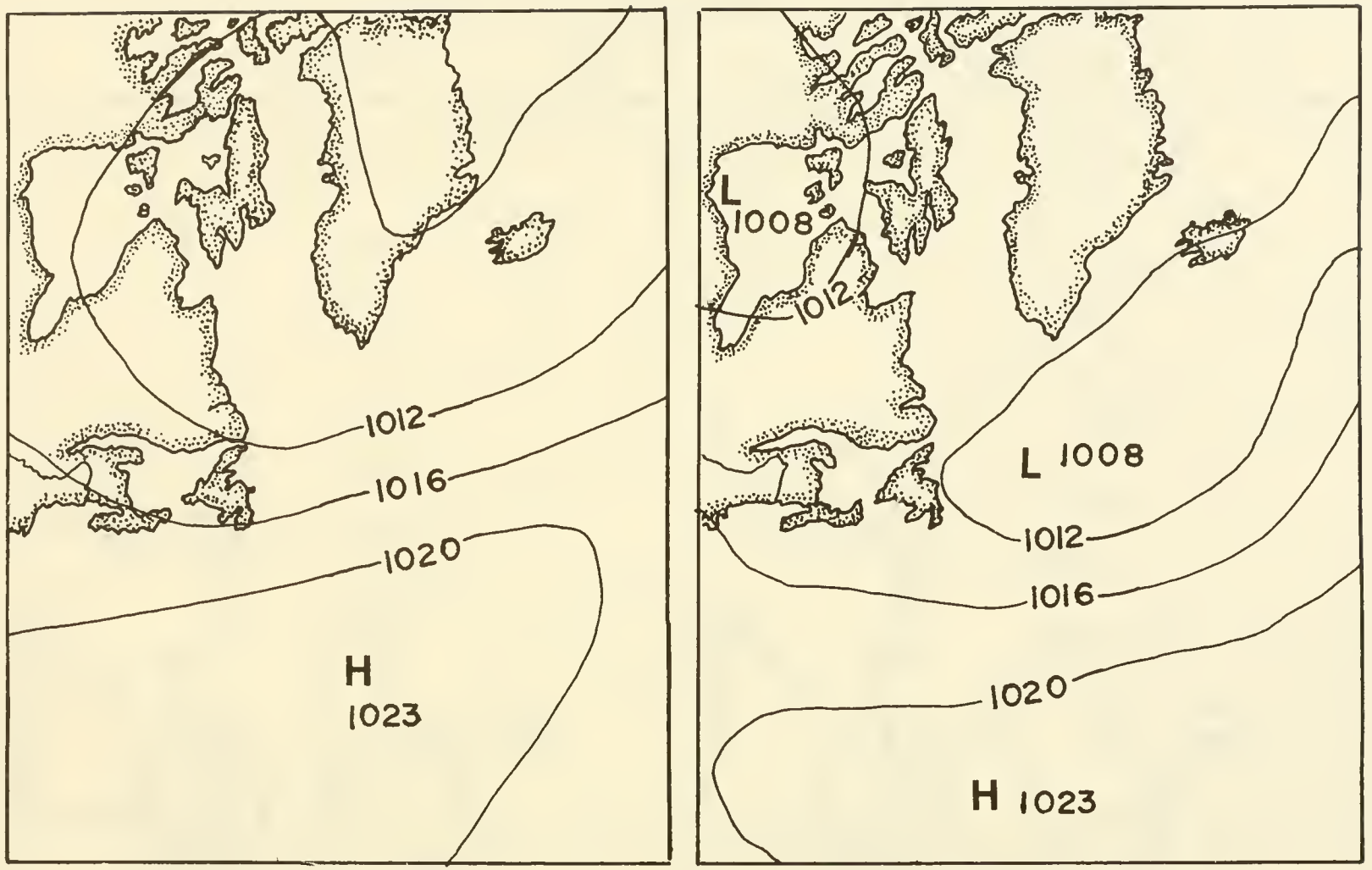
Figure 1j



Normal

July 1981

Figure 1k



Normal

August 1981

Figure 1m

FIGURE 2

OBSERVED SEA ICE CONDITIONS FOR THE DATES INDICATED DURING THE 1981 INTERNATIONAL ICE PATROL SEASON. TOTAL CONCENTRATIONS ARE GIVEN IN TENTHS. THE KEY TO AND THE DESCRIPTION OF THE TYPES OF ICE ARE GIVEN BELOW. SEA ICE SYMBOLS CONFORM WITH WORLD METEOROLOGICAL ORGANIZATION STANDARD SYMBOLS. COMBINATIONS OF THE SYMBOLS ARE USED TO INDICATE MIXTURES OF ICE TYPES.

**: New Ice. General term for recently formed SEA ICE; composed of ice crystals which are only weakly frozen together.

: Young Ice. SEA ICE in transition between nilas and first year ice; 10–30 cm in thickness.

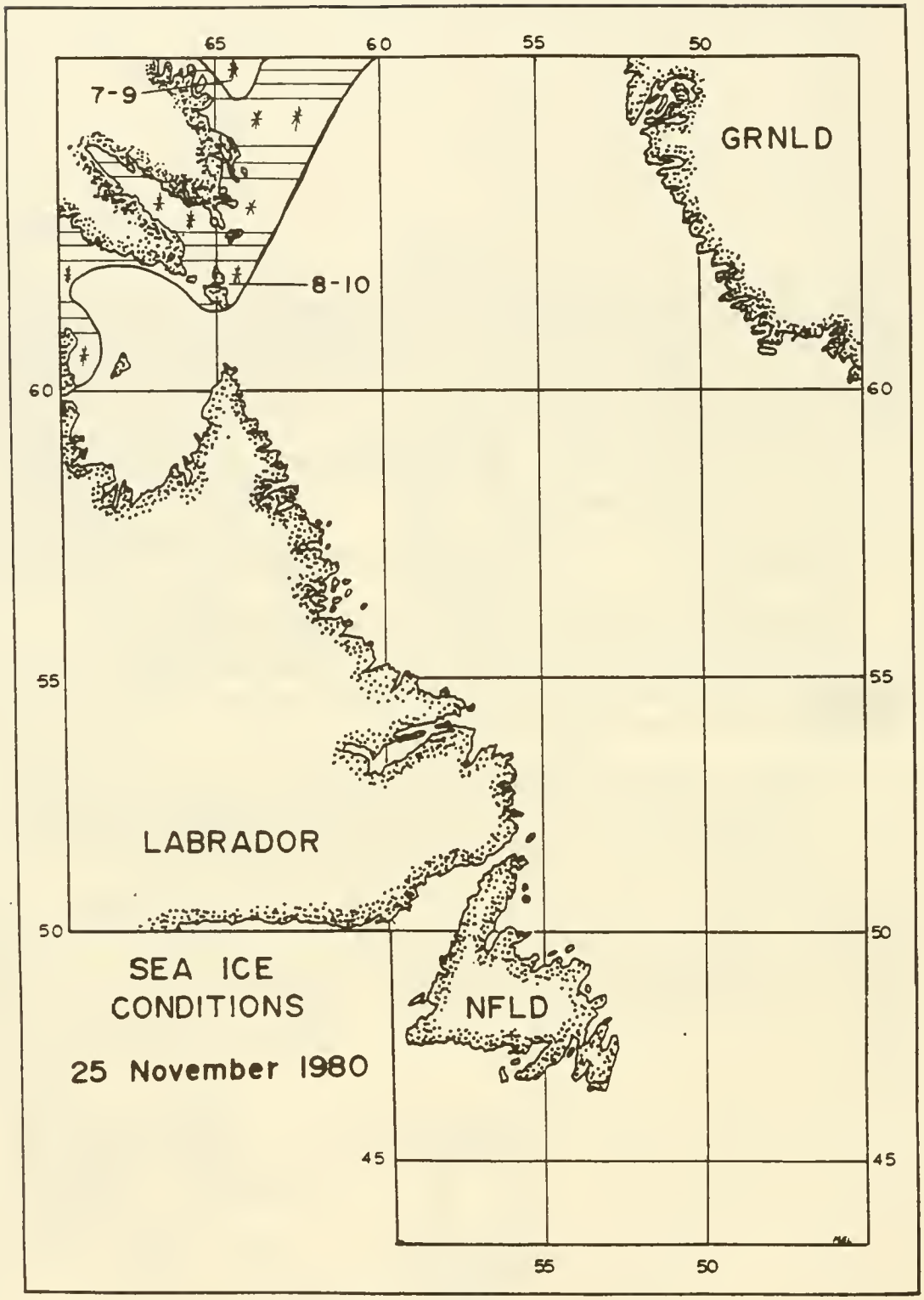
: First Year. SEA ICE of not more than one winter's growth, developing from young ice; thickness 30 cm to 2 m.

: Old Ice. SEA ICE which has survived at least one summer's melt. Most topographic features are smoother than first year ice.

: Patches, Strips and Belts. Patches. An area of PACK ICE less than 10 km across. Belts. A large feature of PACK ICE arrangement; longer than it is wide; from 1 km to more than 100 km in width. Strips. Long narrow area of PACK ICE about 1 km or less in width; usually composed of small fragments detached from the main mass of ice, and run together under the influence of wind, swell or current.

SEA ICE: Any form of ice found at sea which has originated from the freezing of sea water.

PACK ICE: Term used in a wide sense to include any area of sea ice, other than fast ice, no matter what form it takes or how it is disposed.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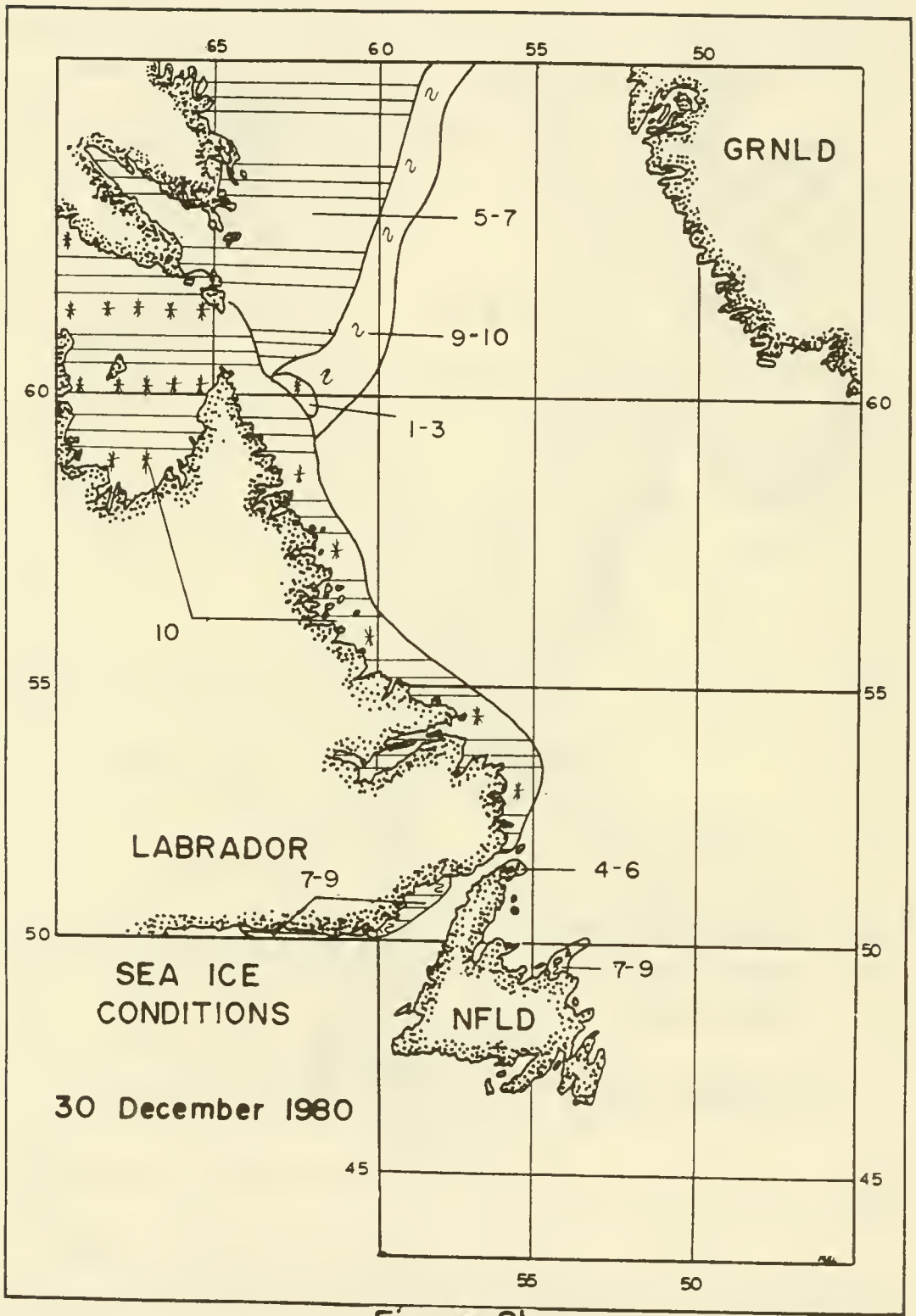
60
55
50
7-9
8-10
GRNLD
60
55
50
LABRADOR
SEA ICE
CONDITIONS
25 November 1980
NFLD
45
55
50

Figure 2a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GRNLD
5-7
9-10
1-3
60
10
55
LABRADOR
7-9
4-6
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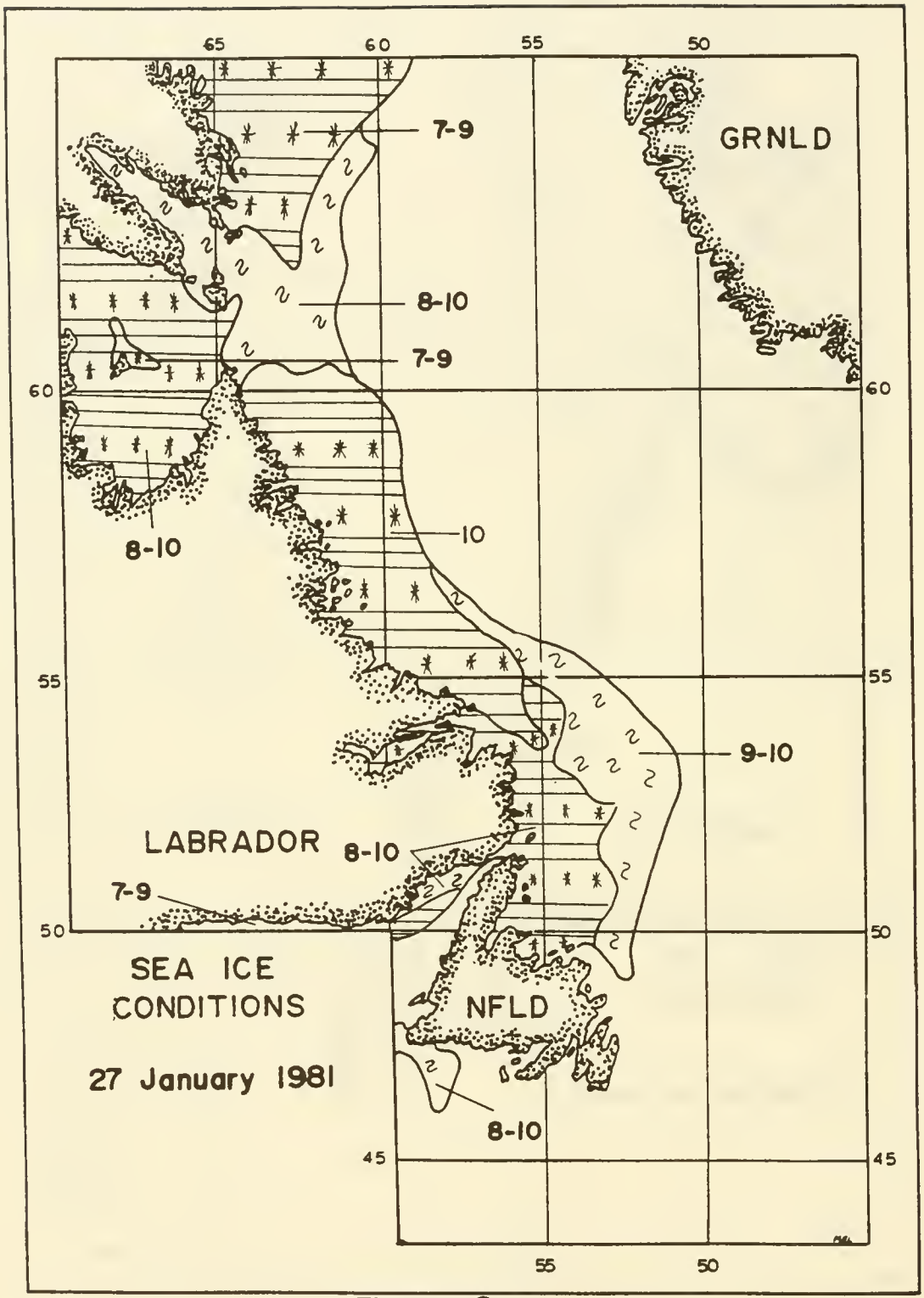
SEA ICE
CONDITIONS
30 December 1980
NFLD
7-9
45
55
50

Figure 2b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GRNLD
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8-10
7-9
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8-10
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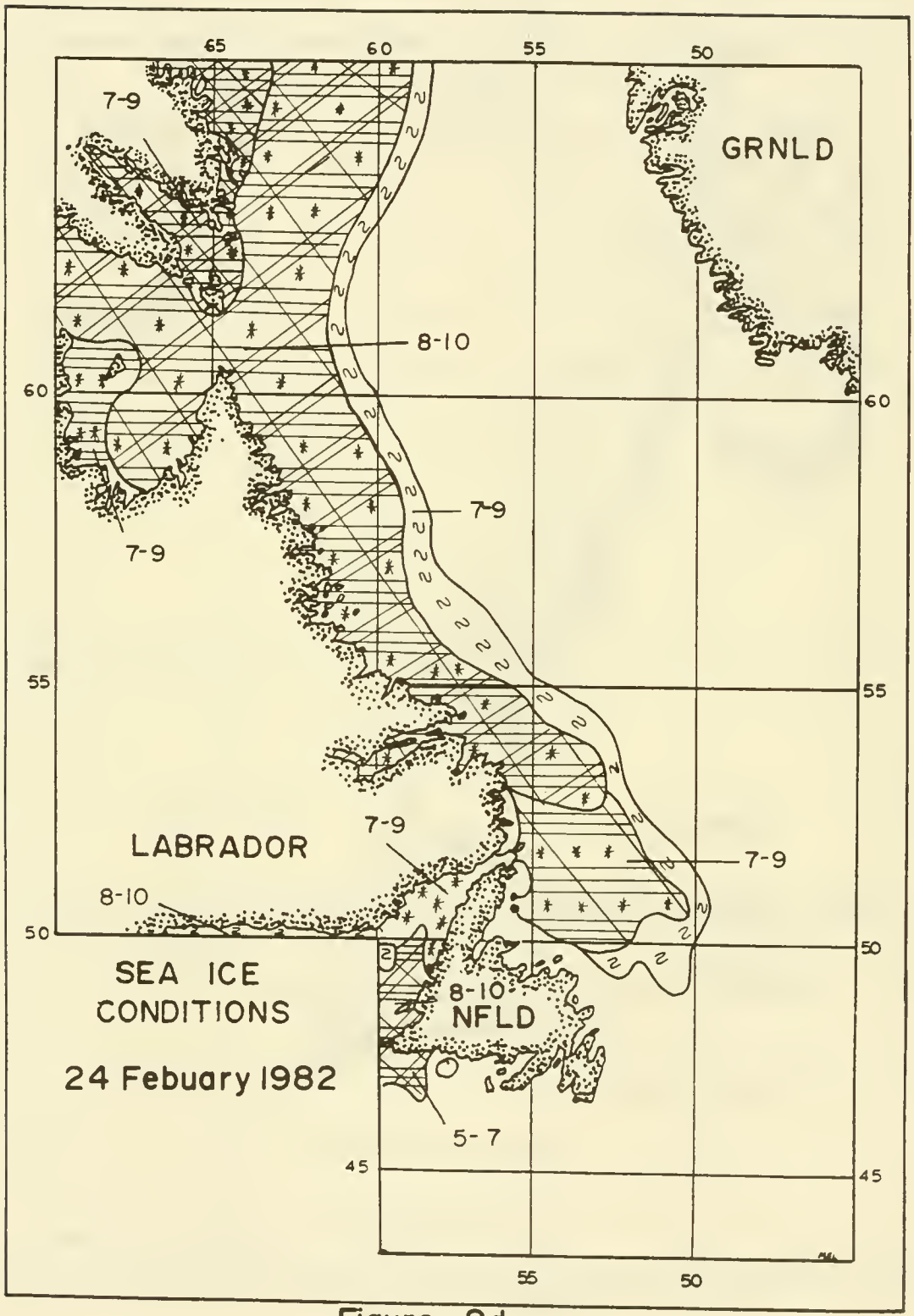
55
9-10
LABRADOR
8-10
7-9
50
SEA ICE
CONDITIONS
27 January 1981
NFLD
8-10
45
55
50

Figure 2c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GRNLD
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7-9
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7-9
LABRADOR
7-9
8-10
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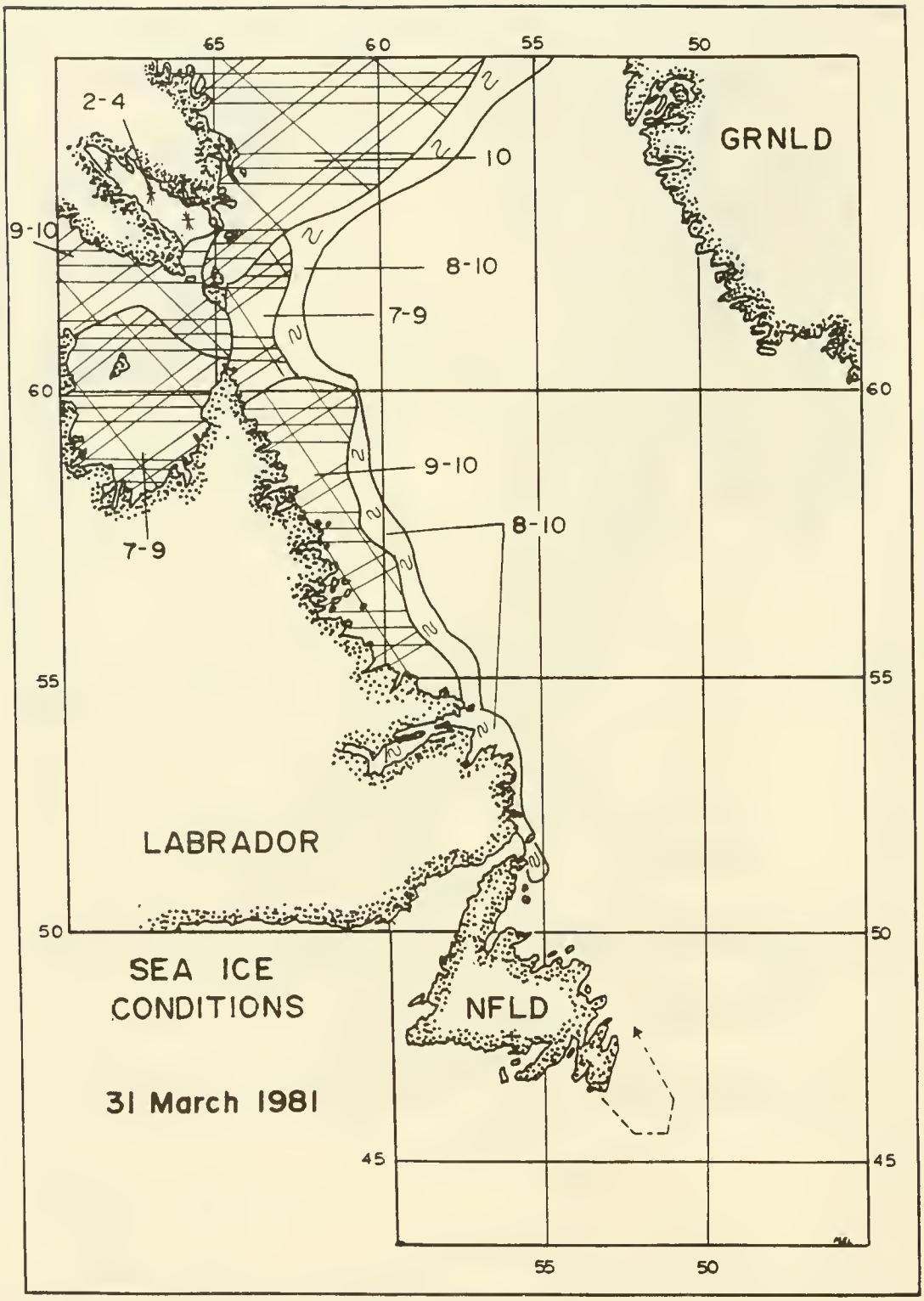
SEA ICE
CONDITIONS
24 Febuary 1982
8-10
NFLD
5-7
45
45
55
50

Figure 2d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2-4
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9-10
8-10
7-9
GRNLD
60
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8-10
7-9
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LABRADOR
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SEA ICE
CONDITIONS
31 March 1981
NFLD
45
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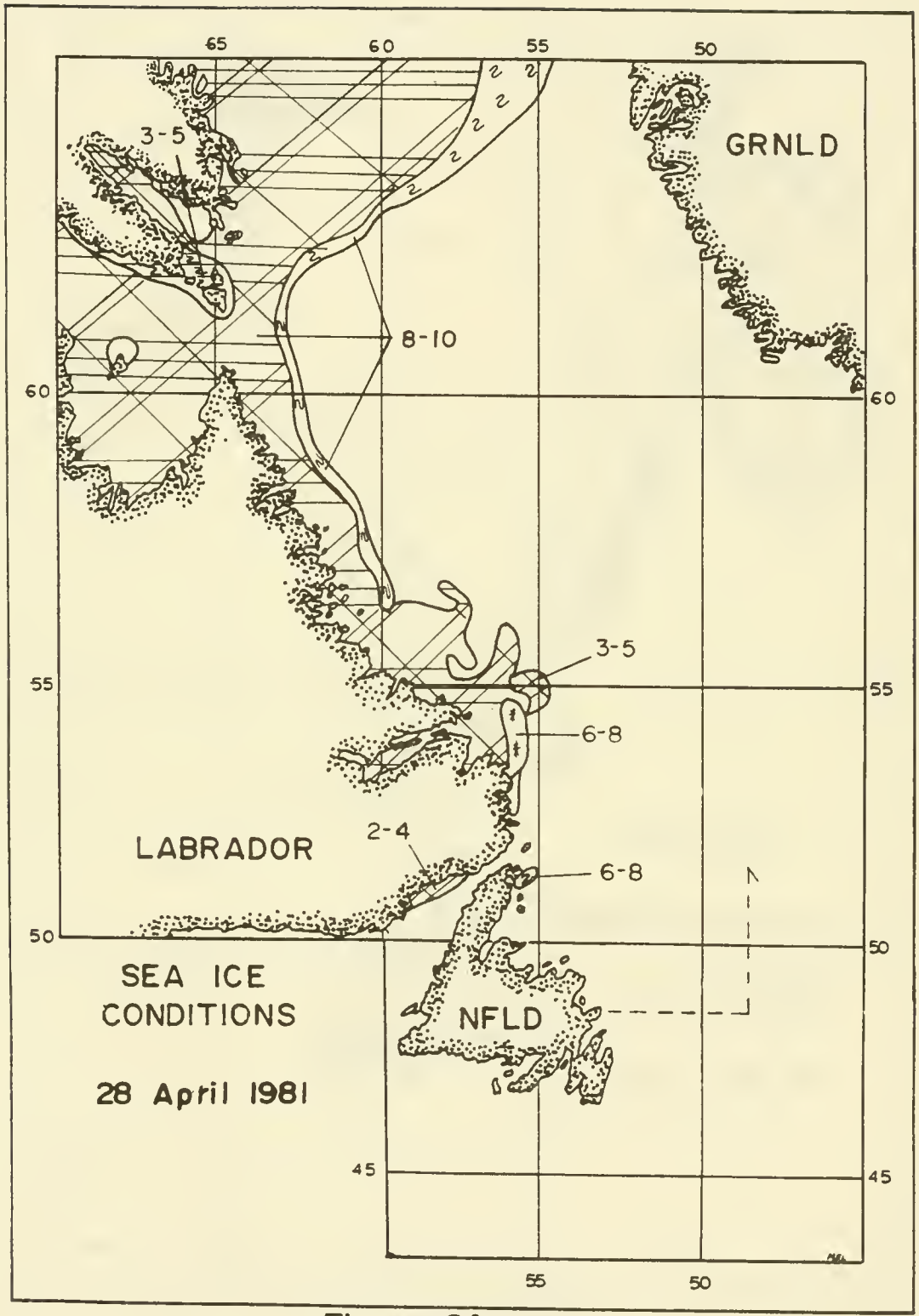
Figure 2e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3-5
GRNLD
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LABRADOR
2-4
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SEA ICE
CONDITIONS
28 April 1981
NFLD
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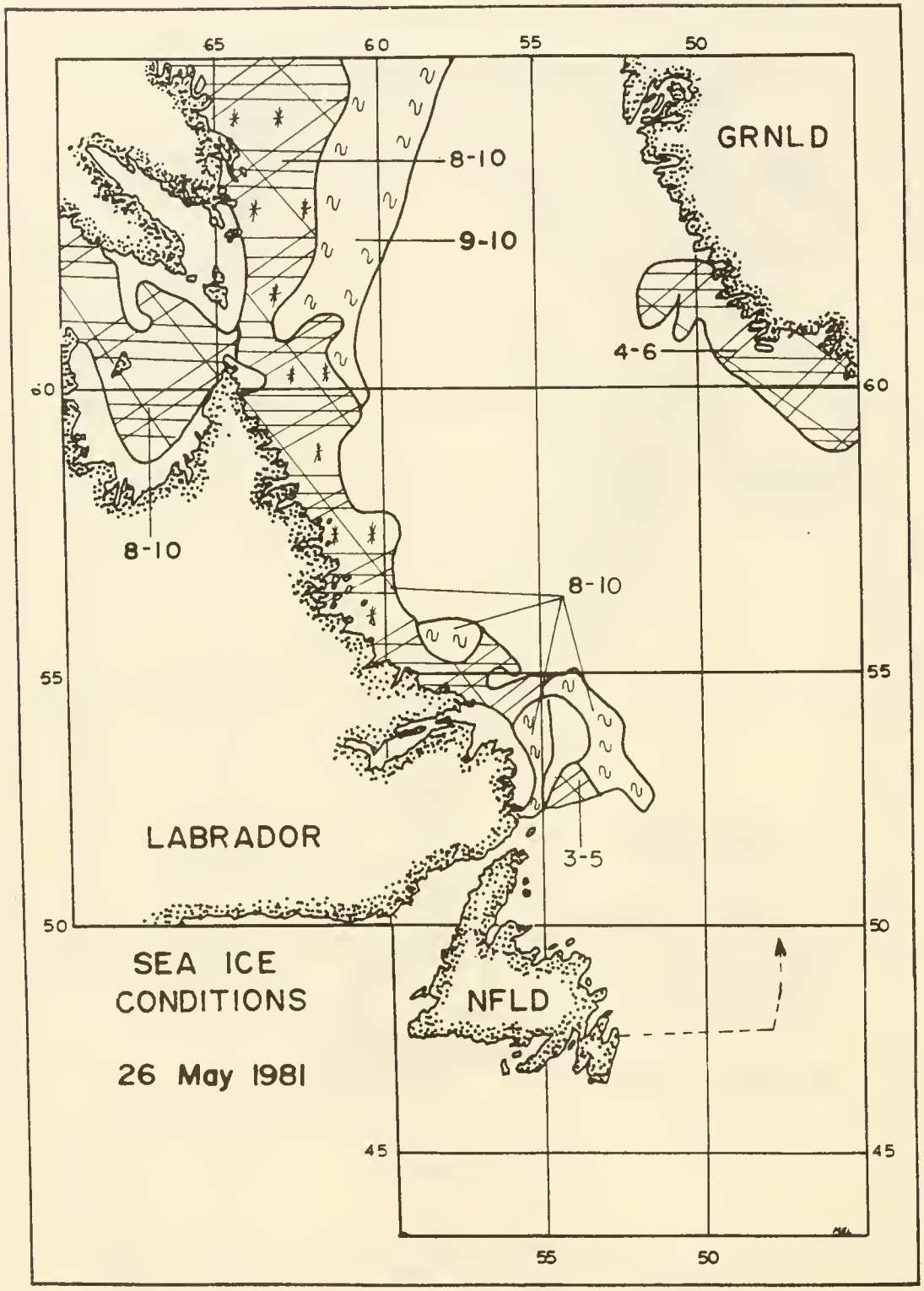
Figure 2f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GRNLD
8-10
9-10
4-6
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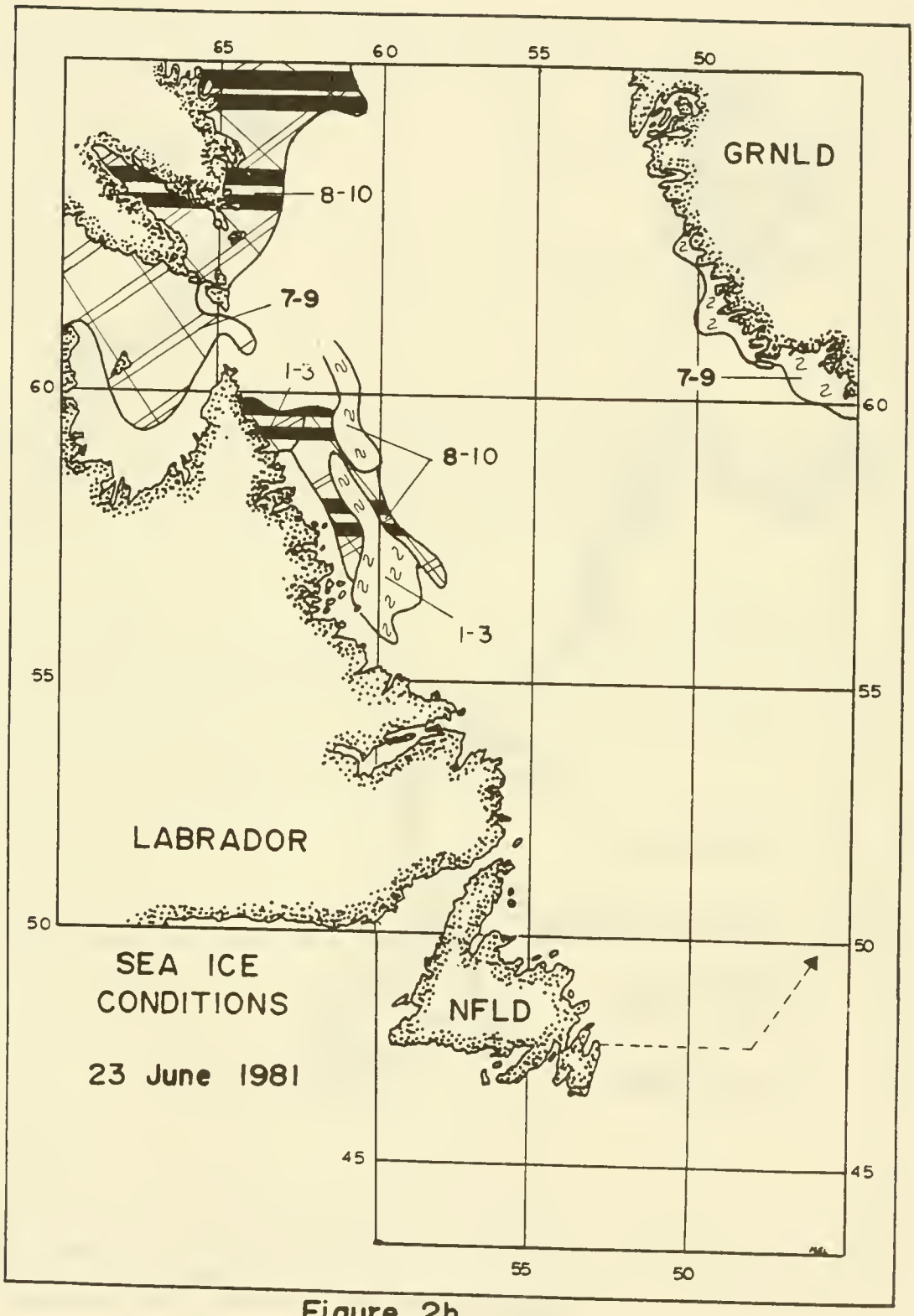
8-10
8-10
55
55
LABRADOR
3-5
50
50
SEA ICE
CONDITIONS
26 May 1981
NFLD
45
45
55
50

Figure 2g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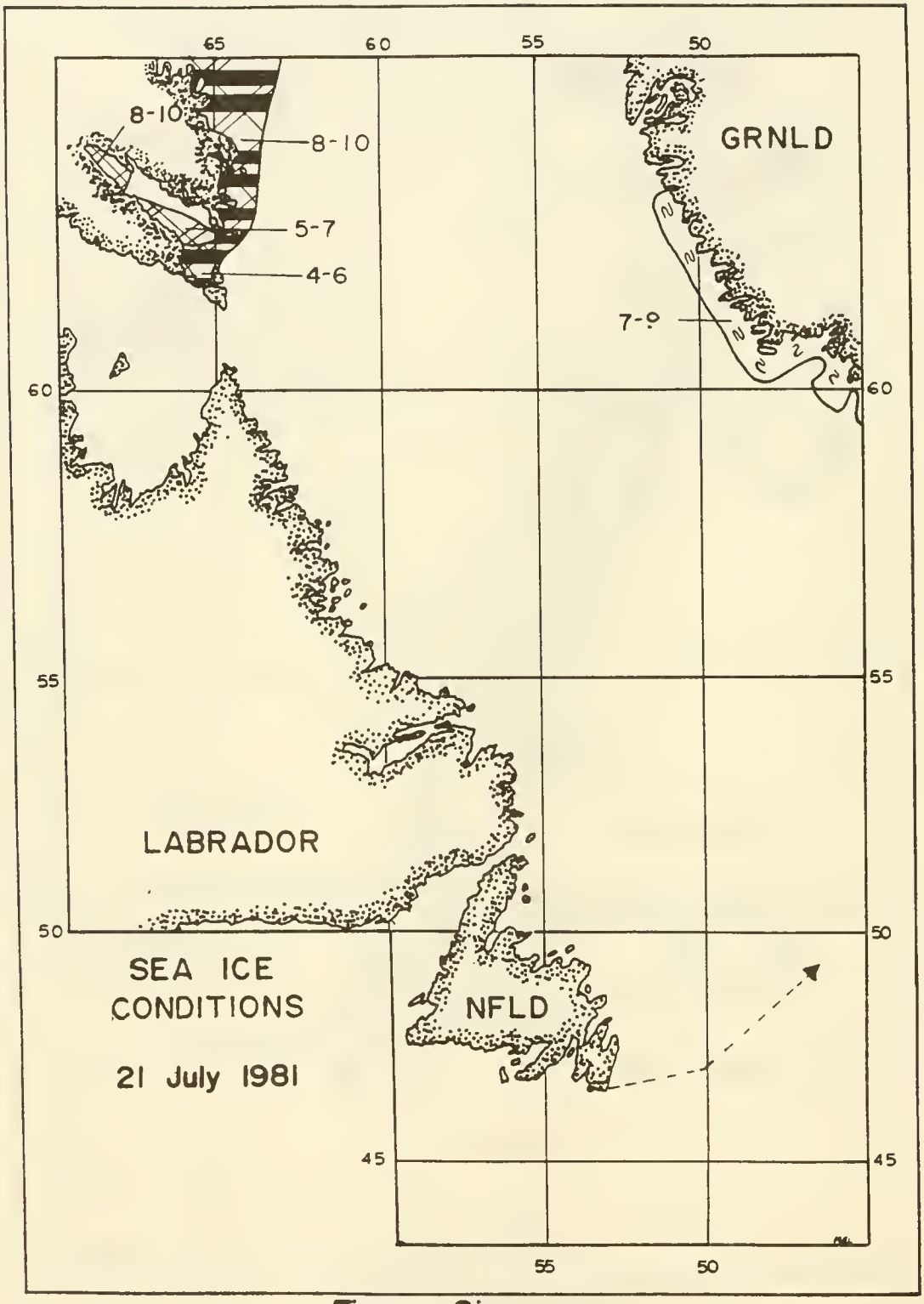
60
55
50
GRNLD
8-10
7-9
1-3
7-9
8-10
1-3
60
55
50
45
LABRADOR
NFLD
SEA ICE
CONDITIONS
23 June 1981

Figure 2h


65
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8-10
8-10
5-7
4-6
GRNLD
7-9
60
55
50
LABRADOR
SEA ICE
CONDITIONS
21 July 1981
NFLD
45
55
50

Figure 2i

FIGURE 3

THE ESTIMATED LIMITS OF ALL KNOWN ICE IN THE REGION OF THE GRAND BANKS FOR THE 1981 INTERNATIONAL ICE PATROL ACTIVE SEASON. THE ICE CONDITIONS ARE FOR 1200 GREENWICH MEAN TIME FOR THE DATE INDICATED. THE POSITIONS SHOWN ARE BASED ON OBSERVED AND FORECAST POSITIONS.

KEY

△ : BERG

▲ : BERG (MORE THAN ONE)

⏢ : GROWLER

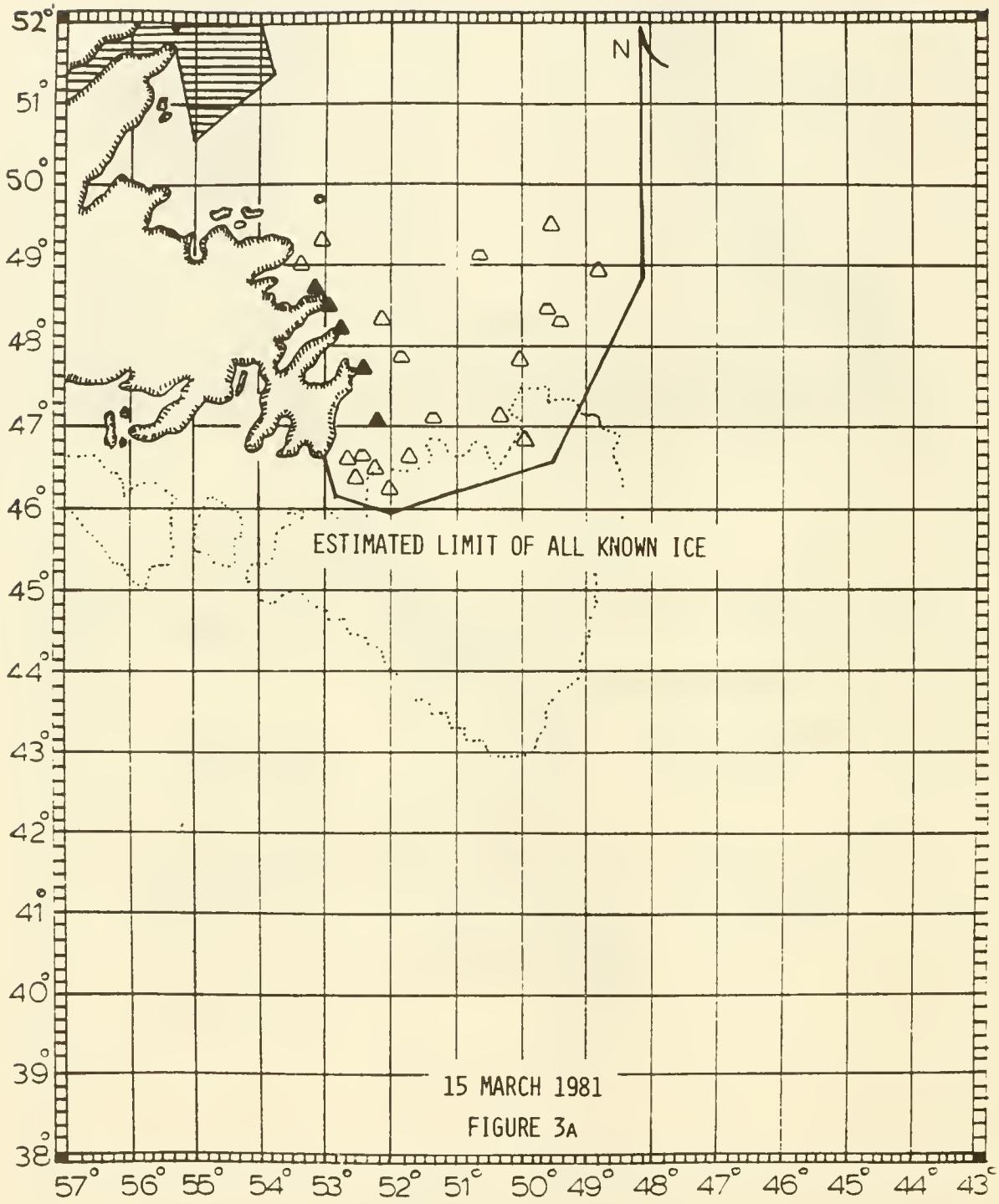
▬ : GROWLER (MORE THAN ONE)

× : RADAR CONTACT

SEA ICE CONDITIONS

: LESS THAN 7 TENTHS

: 7 TENTHS OR MORE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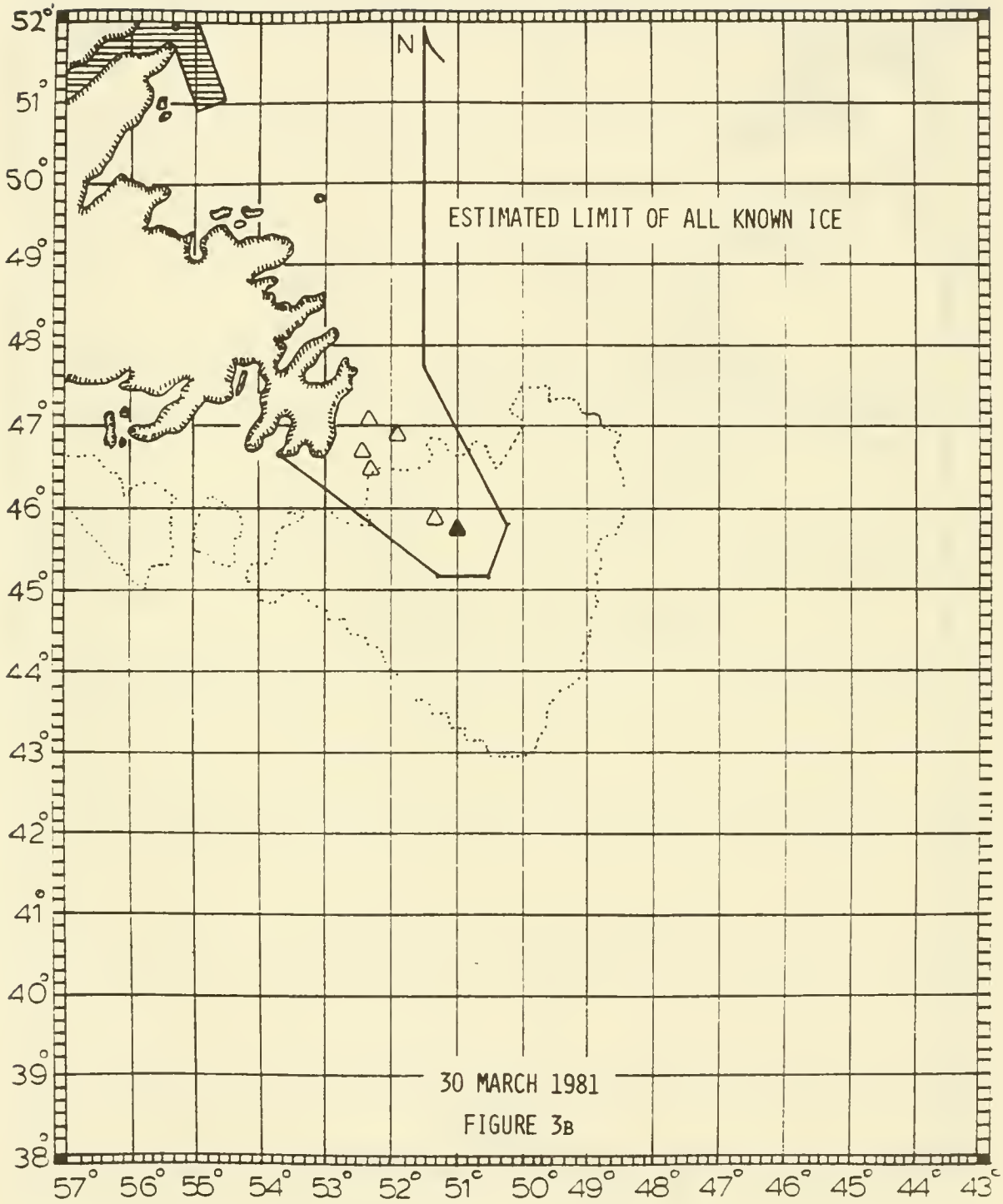
N
ESTIMATED LIMIT OF ALL KNOWN ICE
15 MARCH 1981
FIGURE 3A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ESTIMATED LIMIT OF ALL KNOWN ICE
30 MARCH 1981
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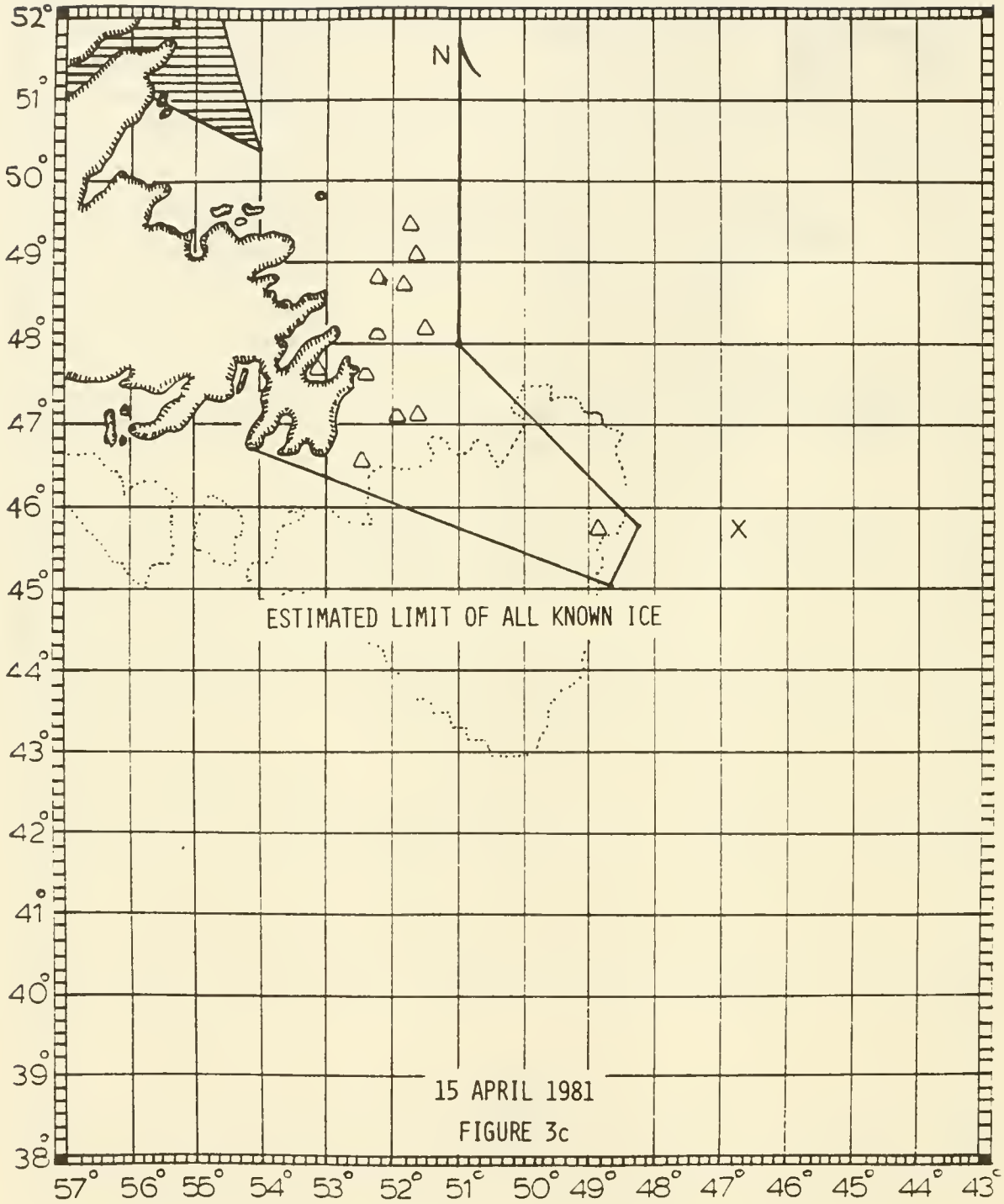
FIGURE 3B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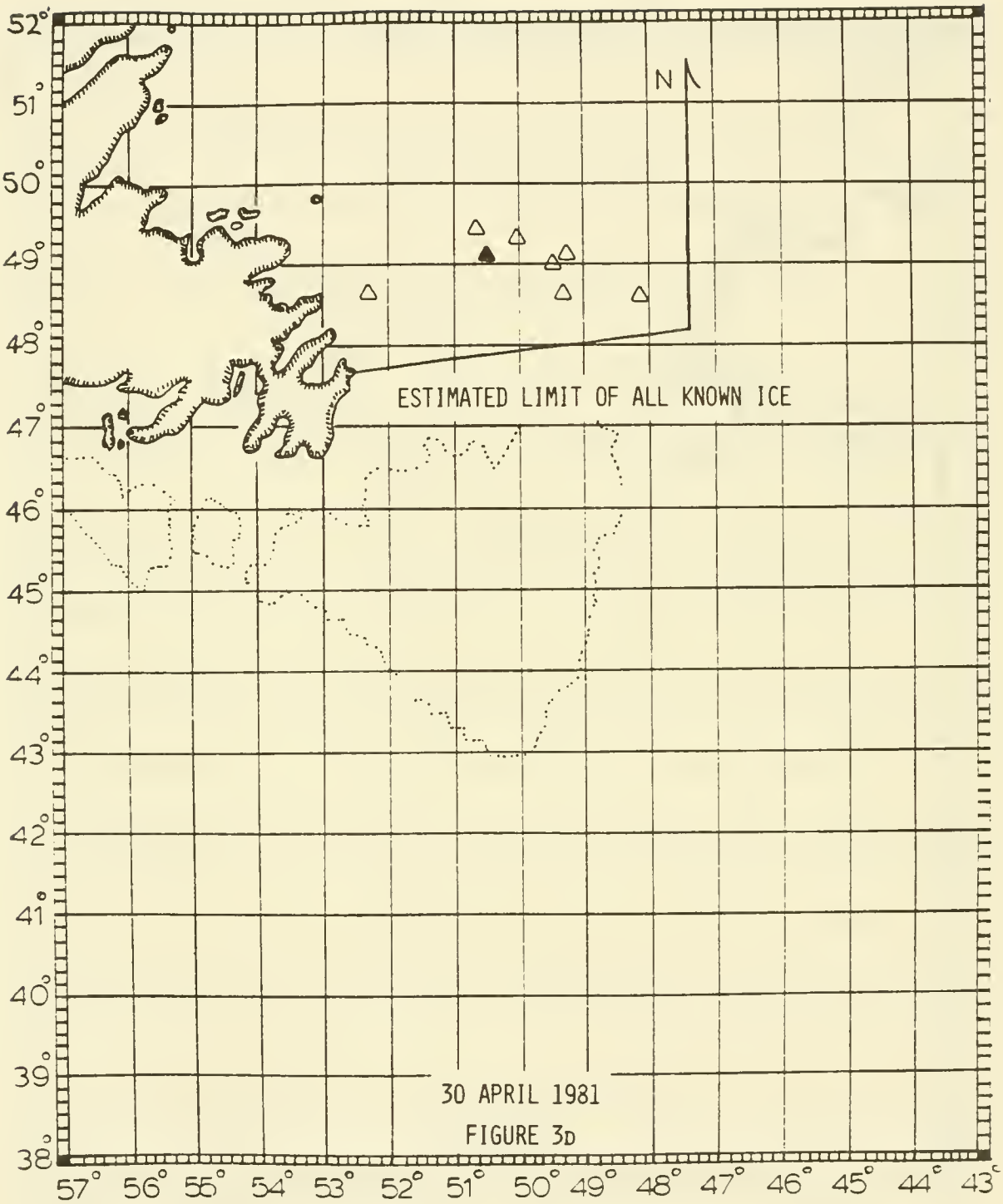
ESTIMATED LIMIT OF ALL KNOWN ICE
15 APRIL 1981
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
FIGURE 3c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ESTIMATED LIMIT OF ALL KNOWN ICE
30 APRIL 1981
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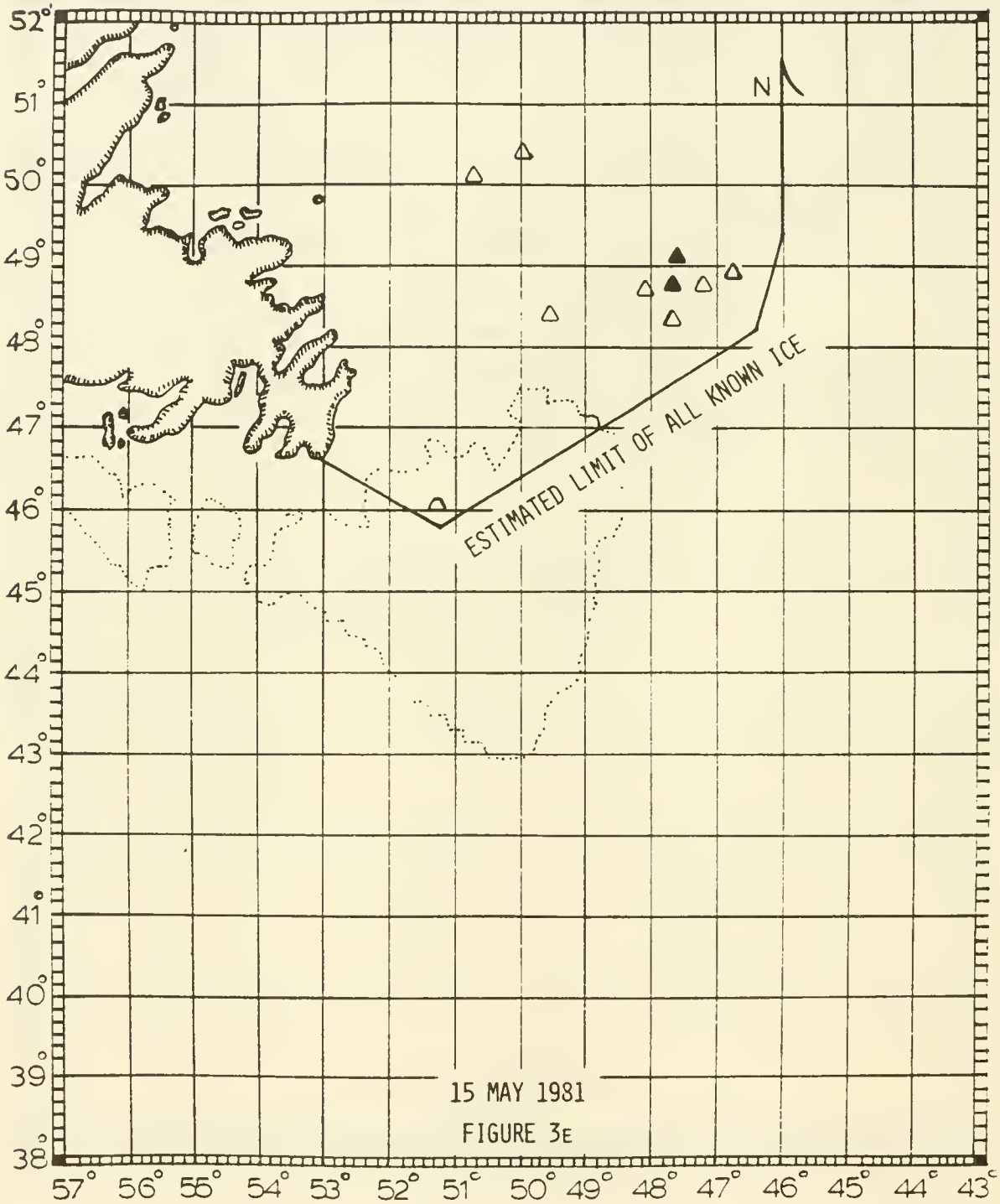
FIGURE 3D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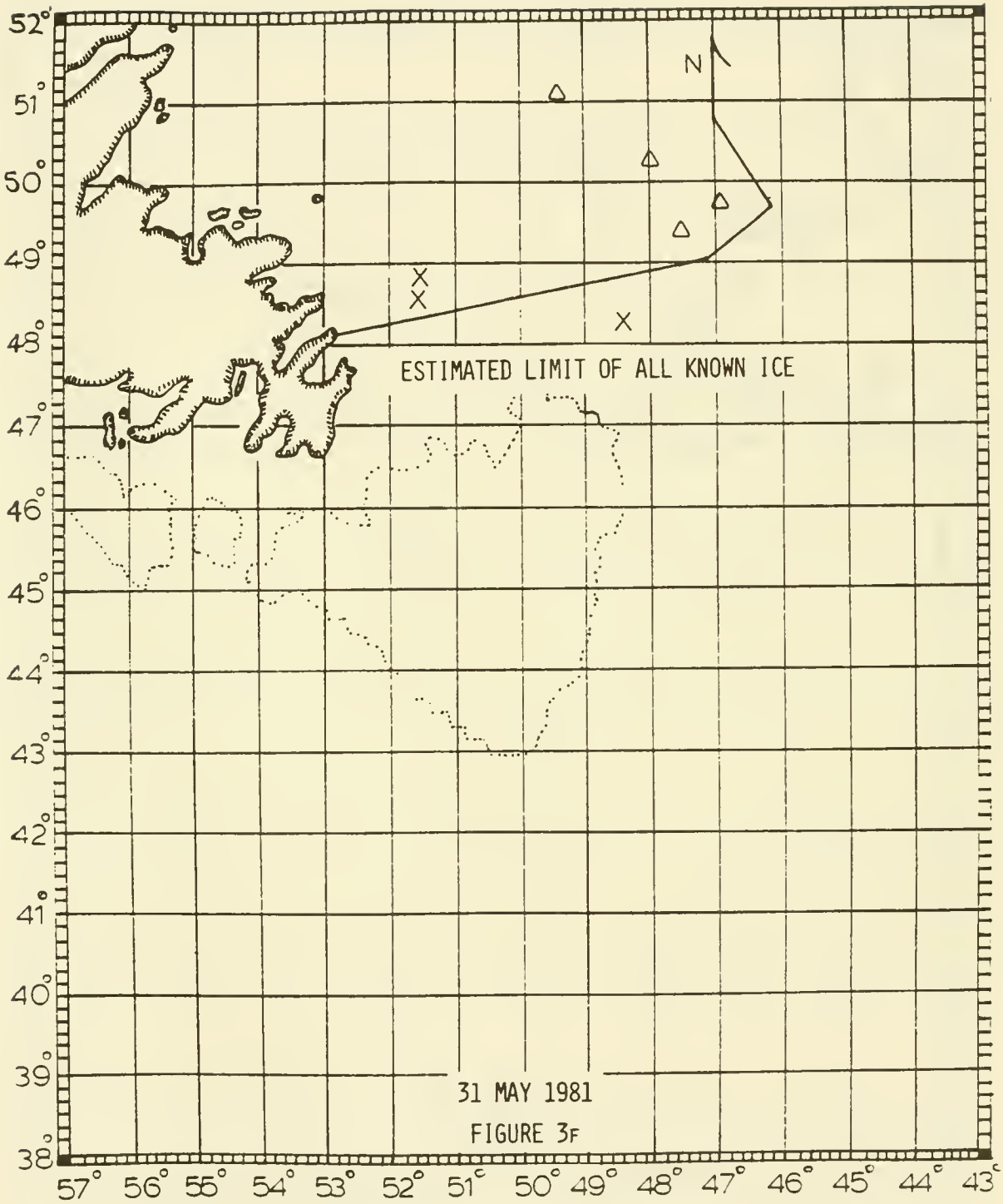
N
ESTIMATED LIMIT OF ALL KNOWN ICE
15 MAY 1981
FIGURE 3E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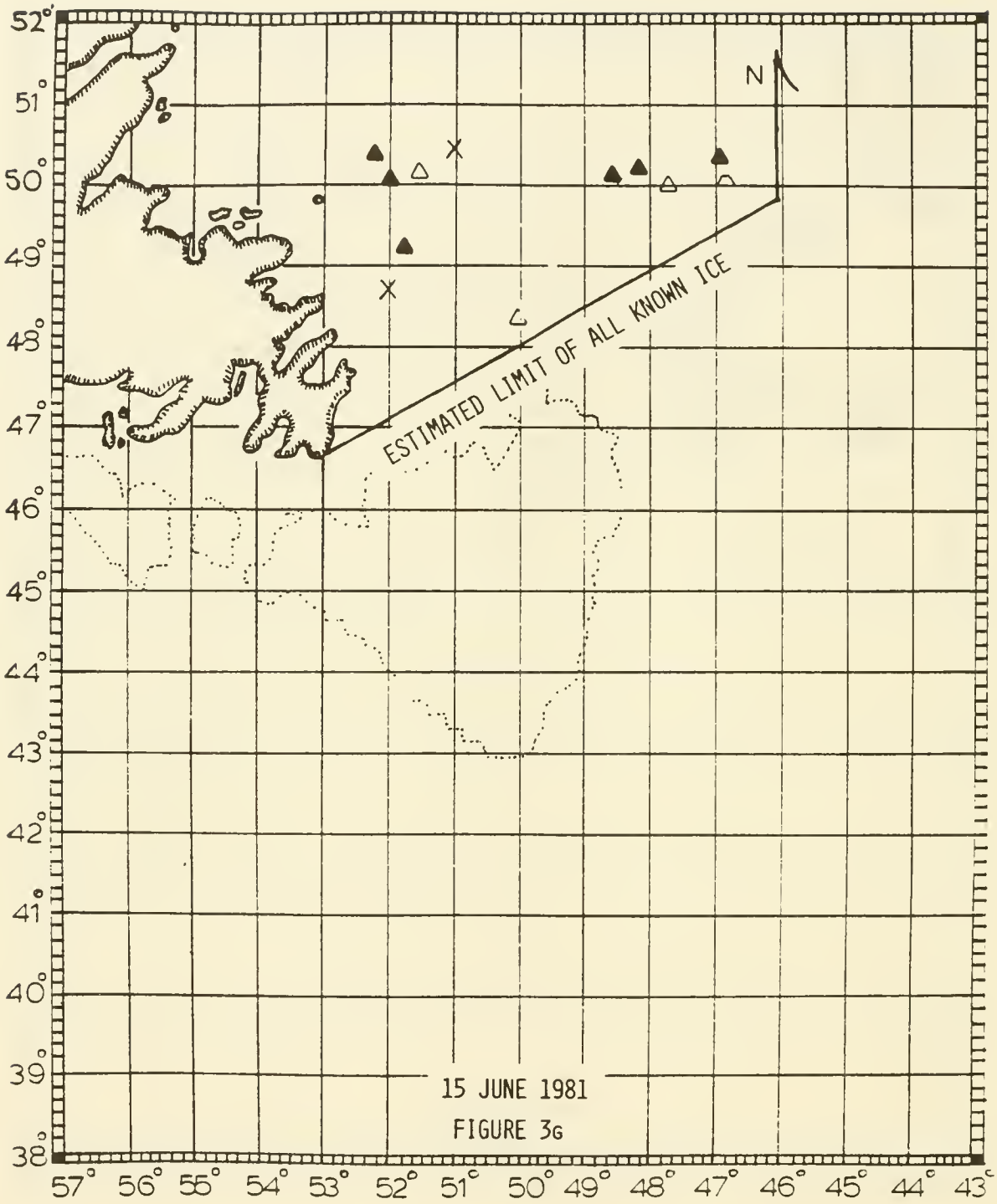
N
ESTIMATED LIMIT OF ALL KNOWN ICE
31 MAY 1981
FIGURE 3F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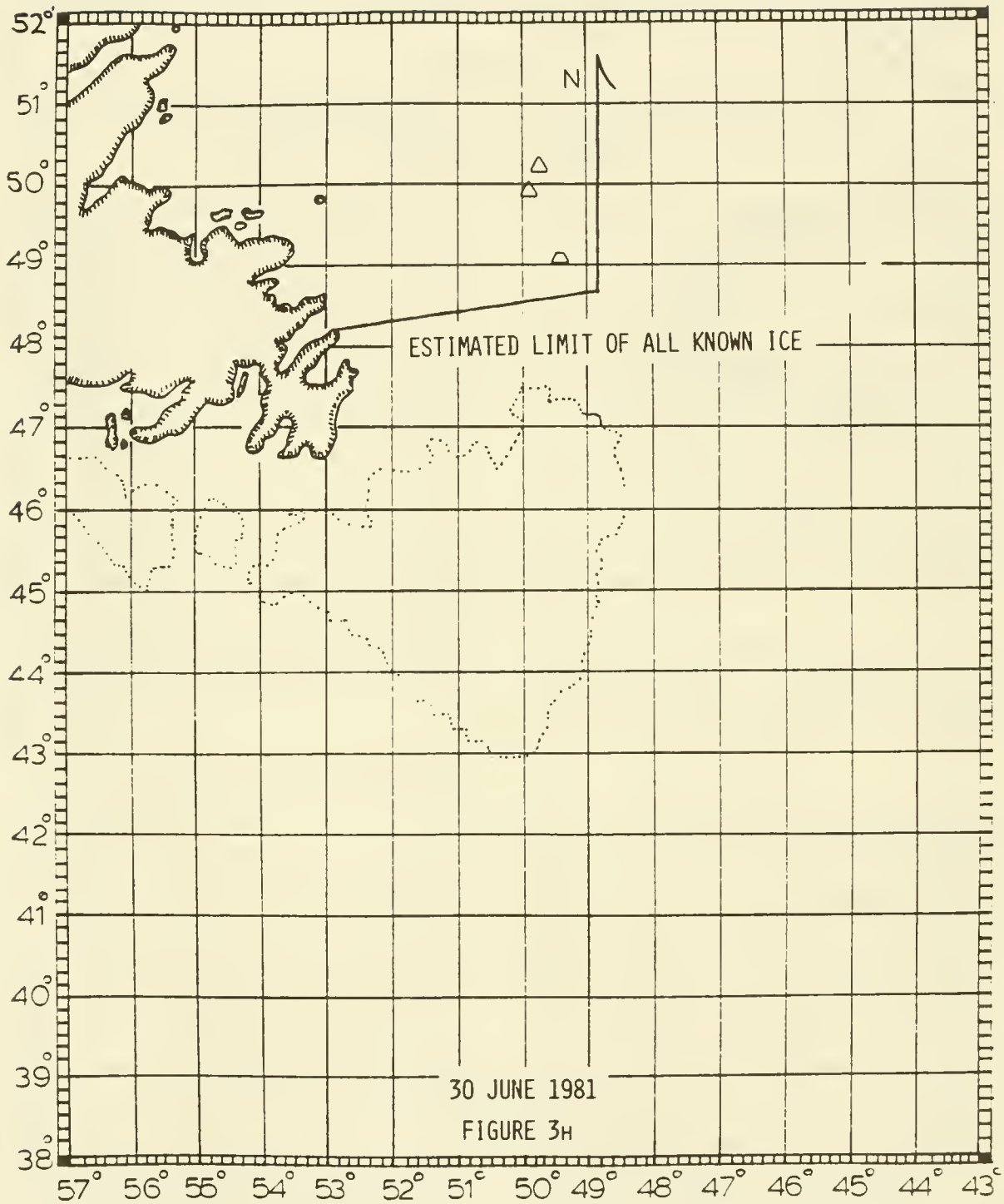
N
ESTIMATED LIMIT OF ALL KNOWN ICE
15 JUNE 1981
FIGURE 3G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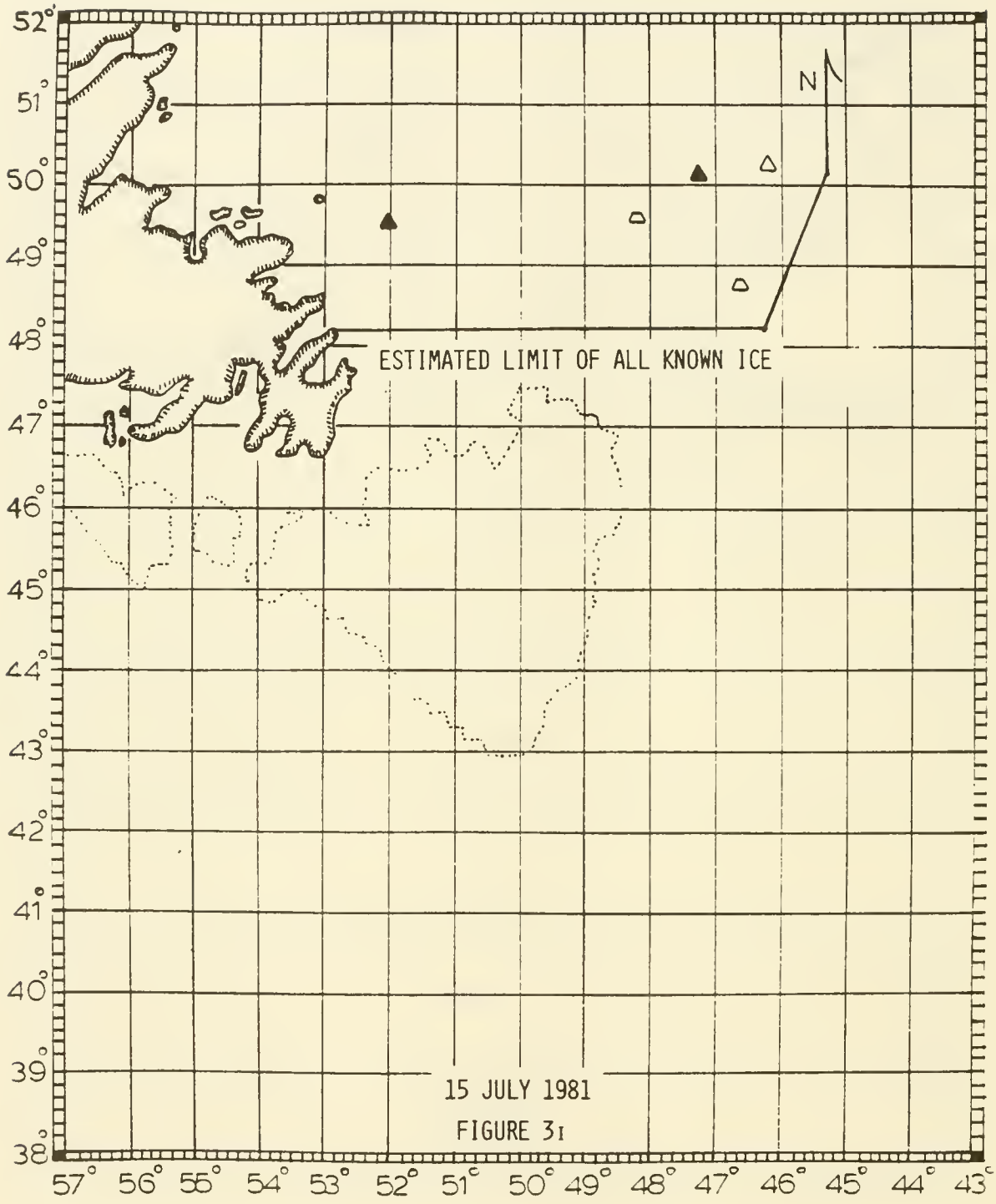
N
ESTIMATED LIMIT OF ALL KNOWN ICE
30 JUNE 1981
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°

FIGURE 3H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57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
N
ESTIMATED LIMIT OF ALL KNOWN ICE
15 JULY 1981
FIGURE 31

APPENDIX A
OCEANOGRAPHIC CONDITIONS ON THE GRAND BANKS DURING THE 1981 INTERNATIONAL ICE PATROL SEASON

JOSEPH L. SHUHY

The validation of the currents contained in the model used to drift icebergs on the Grand Banks was accomplished using TIROS Oceanographic Drifters (TOD) during the 1981 International Ice Patrol (IIP) Season. Five drifters were deployed (Table A–1): drifters 2593, and 2635 were deployed in the Labrador Current; drifter 2594 to the west of the Labrador Current, and drifter 2596 was deployed to the east of the Avalon Peninsula. The drifters were airdeployed from a Coast Guard C–130. Drifter 2593 stopped transmitting after 7 days, but all the other drifters performed without casualty throughout the season. The drifters were equipped with 10 meter long window shade drogues tethered 10 meters below the surface. The drifters measured and transmitted sea surface temperature and drogue tension (which verified the presence of the drogue). Drifter position was determined from the doppler shift of the transmitting frequency.

Drifter trajectories are shown in Figure A–1. The drift trajectories were prepared using standard computer programs developed at the Coast Guard Oceanographic Unit.

A computer program was developed to modify the IIP current file based on drifter trajectories. This model will be evaluated using the 1981 drift data. Basically, a time dependent Ekman wind current will be calculated and subtracted from the surface current as obtained from the drifter resulting in a value for the local sea current. This local surface current will then be smoothed into the IIP current file and relaxed to the historical value within two weeks. The evaluation of the program is planned for completion prior to the start of the 1982 IIP season.

Two drifters (2631 and 2635) were air-deployed on 1 April 1981. Drifter 2635 was deployed at position 48°59.7′N, 49°57.8′W which was in the Labrador Current. The sea surface temperature as recorded by the drifter was 2.7°C. The drifter initially moved in a southeasterly direction remaining between the 500 and 1000 meter contour, but then started to go north of Flemish Cap generally parallel to the 1000 meter contour. The average velocity of the drifter during this time was about 24 cm/sec. The drifter then traveled south on the western side of Flemish Cap continuing parallel to the 1000 meter contour to about 46°20′N where it was caught by the anticyclonic circulation around Flemish Cap traveling at about 20 cm/sec. By the end of July 1982, the drifter traveled around Flemish Cap and was located on the southern side of the Cap. Shortly thereafter, (not shown in Figure A–1) it was caught in the North Atlantic Current and traveled in a general northeasterly direction.

Drifter 2631 was also deployed on 1 April 1981 about 30 nautical miles to the east of drifter 2635. The trajectory of 2631 took it north of Flemish Cap traveling at about 28 cm/sec. The sea surface temperatures during this time as recorded by the drifter were about 3 to 3.5°C.

The drifter then moved to the northwest and the sea surface temperature as recorded by the drifter quickly rose to about 9°C indicating that the drifter was no longer in the Labrador Current but had entered the North Atlantic Current. The drifter continued moving in a generally easterly direction after leaving the Ice Patrol region.

Drifter 2596 was deployed just to the east of Avalon Peninsula, and circled in a cyclonic direction before starting a slow eastward movement. This drift was contrary to the expected southerly drift along the coastal branch of the Labrador Current. The sea surface temperature as measured by the drifter during this time ranged from about 0.9°C to 1.6°C. The sea surface temperature chart published by the Canadian Forces METOC Center for the period 4 May to 10 May 1981, which is derived from satellite imagery, shows a cyclonic

cold core (< 2°C) eddy in this location. The average speed in the eddy was 11 cm/sec.

Drifter 2593 and 2594 were deployed on 28 April 1981. Drifter 2593 was deployed in the Labrador Current at position 49°00′N, 49°56′W but was only operational for seven days before it malfunctioned and stopped transmitting. During the brief period that it did transmit, it moved in an anticyclonic direction. Drifter 2594 was deployed about 25 nautical miles to the west of Drifter 2593 on the western side of the Labrador Current. It moved in a generally easterly direction until it entered the Labrador Current and then traveled southeasterly between the 200 and 500 meter contours at about 27 cm/sec. As the drifter traveled south of 48°N latitude, it circled clockwise around an underwater knoll and then continued south generally between the 500 and 1000 meter contours at an average speed of about 28 cm/sec. Sea surface temperatures above 48°N latitude ranged from about 0.5 to 3.0°C. As the drifter moved south, it recorded temperatures from about 3.0 to 7.5°C at the southern limit of its drift when it was caught up in the northeasterly drift of the North Atlantic Current. Southwest of Flemish Cap, the drifter was caught up in a meander of the North Atlantic Current which was very similar to the path taken by drifter 2630 which was deployed during the 1980 Ice Patrol season. (See Ice Patrol Bulletin No. 35.)

The trajectories of the TODs deployed during the 1981 season show that much of the current pattern in the area was bathymetrically controlled. The flow of the Labrador Current was along the continental slope. As the current approached Flemish Pass, part of the flow went north of Flemish Cap parallel to the 1000 meter contour. However, if the drifter was far enough north, it stayed north of Flemish Cap. The anticyclonic circulation around Flemish Cap also followed the bottom bathymetry. The cold core eddy off of the Avalon Peninsula was a new and interesting feature which should be studied in the future.

TABLE A-1
SUMMARY OF TOD DEPLOYMENTS—1981 SEASON

Drifter Number	*Date Deployed*	*Deployment Position*		*Average Positions Per Week*
		Latitude	*Longitude*	
2631	1 April 81	49°00.0′N	49°14.8′W	5.6
3635	1 April 81	48°59.7′N	49°57.8′W	16.8
2596	22 April 81	46°55.0′N	52°42.9′W	16.1
2593	28 April 81	49°00.0′N	49°56.0′W	9.8
2594	28 April 81	49°00.0′N	50°34.0′W	18.2

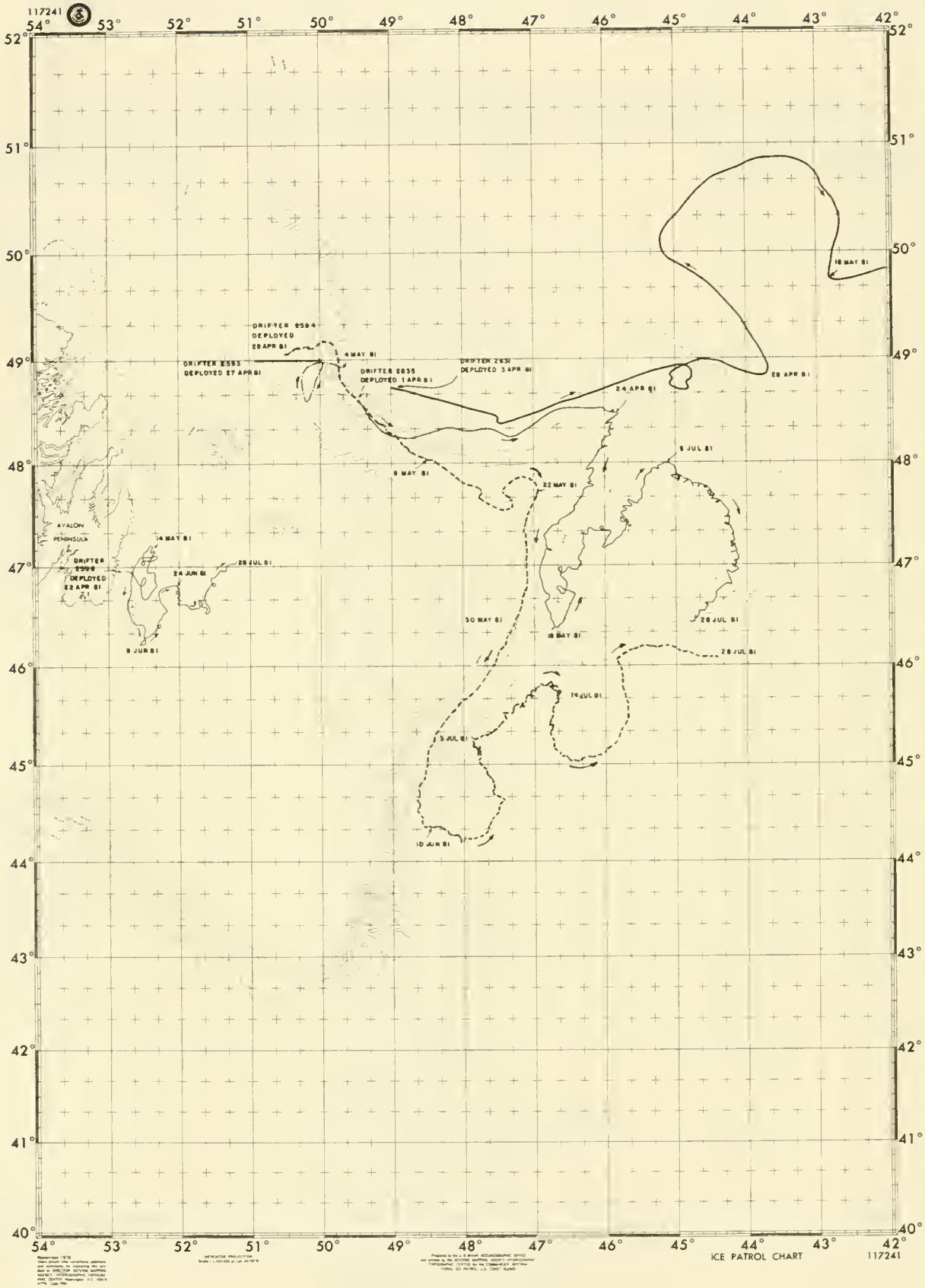

Figure A-1

Trajectories of the TIROS Oceanographic Drifters (TOD) deployed during the 1981 International Ice Patrol season.

APPENDIX B
INTERNATIONAL ICE PATROL ICE AND SST REPORTS FOR 1981

COUNTRY OF REGISTRY	SHIPS	TOTAL ICE REPORTS	TOTAL SST REPORTS
ALGERIA	NEMEMCHA	0	2
BELGIUM	DART EUROPE	1	0
	OSA OSTEND	1	0
CANADA	TRAWLER ZEILA	1	0
	CAPE ROGERS	1	0
	DOAN TRANSPORT	0	2
	IRVING ESKIMO	2	0
	SAGUENAY	0	3
	TRANSPORT	0	4
	VON	1	0
FINLAND	FINNARCTIS	0	2
	KARA	0	21
FRANCE	PELICAN	1	2
GREECE	JOHN LYRAS	0	1
	LENA	1	5
ICELAND	SKAFTAFELL	1	0
INDIA	JAKAT VIJETA	0	3
JAPAN	KORYO MARU	0	1
	TSUKUBA MARU	1	3
	OCEAN BIKO	0	6
LIBERIA	DASHAKI	0	7
	ESSO NASSAU	0	3
	FIRMES	1	0
	KANSAS GETTY	0	18
	VENTURE INDEPENDENCE	0	4
NETHERLANDS	FRISIAN SKIPPER	1	1
NORWAY	BRUNI	0	2
	STAVERN	0	5
PANAMA	JENNIFER	0	4
POLAND	MIROSLAWIEC	1	8
SINGAPORE	GLOBE EXPRESS	0	3
SWEDEN	ATLANTIC PRELUDE	1	0
	ORIENT HARMONY	0	8
	NORLAND	0	5
UNITED KINGDOM	CAST OTTER	0	2
	A C COLEMAN	0	5
	D C COLEMAN	0	2
	CLYMENE	1	0
	GLOBTIK BRITAIN	0	5
	MANCHESTER CONCORDE	2	1
	M. T. NARNIAN SEA	0	7
	STRAIT OF CANSO	0	9
	VEGA SEAL	0	3
UNITED STATES	USCGC EVERGREEN	8	124
	USNS HAYES	1	0
	AMERICAN CHIEFTAIN	0	1
	AMERICAN RELIANCE	0	1
USSR	IVAN DERBENEV	1	0
WEST GERMANY	EMMA OLDENDORFF	1	0
YUGOSLAVIA	MIHO PRACAT	0	19

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